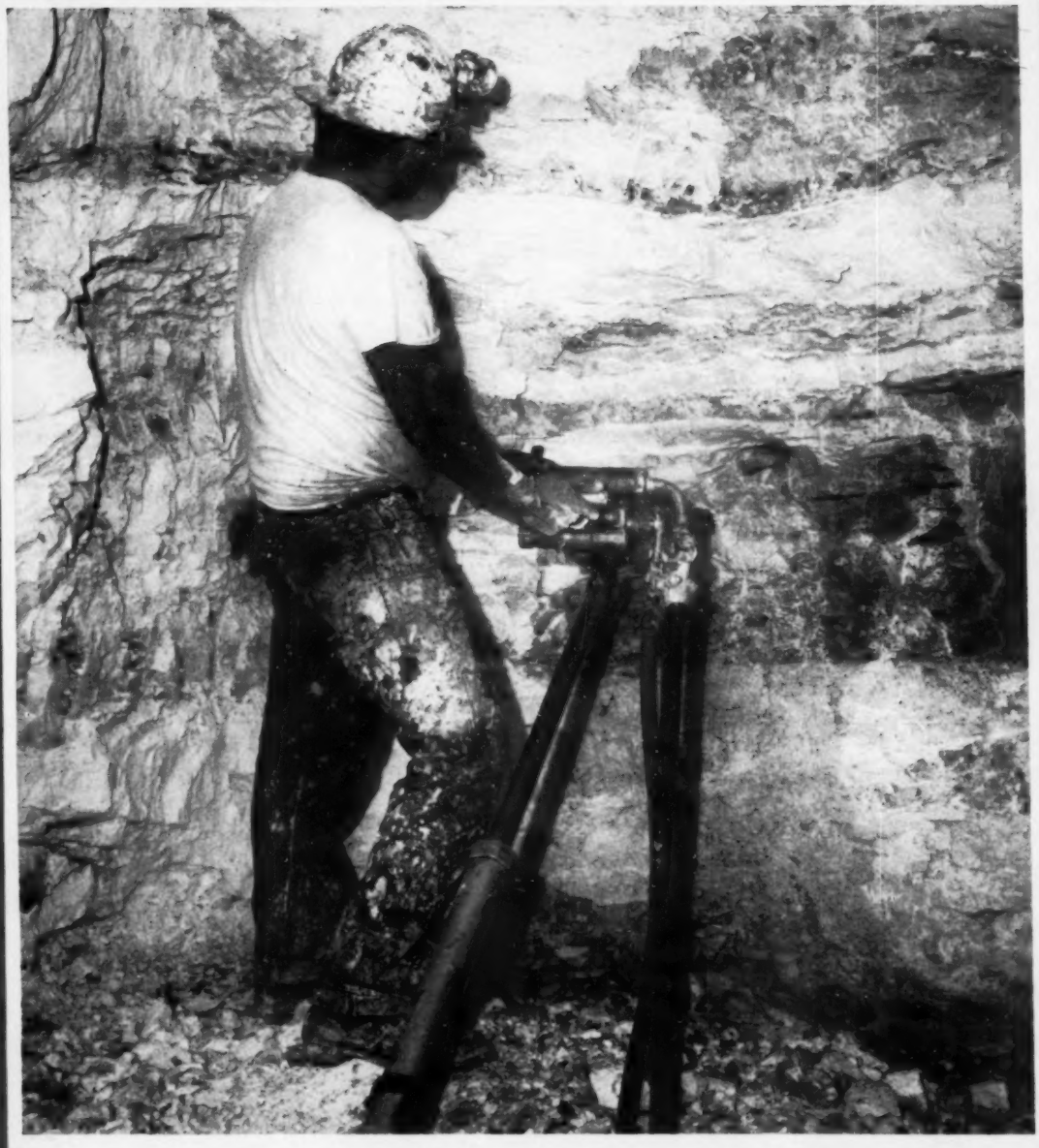
JULY 1957 Vol. 19 No. 8

MINING WORLD

Long-Range Minerals Program Goes To Congress Page 59

How and Why Climax U_3O_8 Uses Solvent Extraction Page 44



How Arizona Asbestos Is Mined and Milled

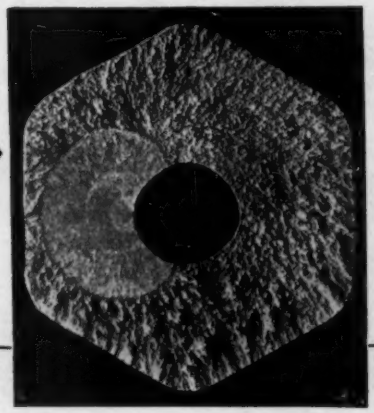
Page 54

50 cents a copy—3s 6d in sterling

more than a million tons a day
processed through
fagergren flotation machines
Between now and this time tomorrow – in 27 U. S. states and in 24 of the principal mining countries throughout the world – Wemco Fagergren Flotation Machines will process well over a million tons of ores. The combined feed, including all the principal metallics and non-metallics from Antimony to Zinc, would equal the cubic content of a 100' x 100' building 72 stories high!
Whether the tonnage you process is large or small, you'll be interested in getting the facts that back up the industry-wide preference for Wemco Fagergrens . . . now in use in individual installations of from one to over 700 cells. Write today, or call in your Wemco representative.
WEMCO
CALIFORNIA
Representatives in principal cities of the United States and in Canada and in major countries throughout the world.

The steel with up to 50% longer life!

New anti-corrosion treatment stops premature breakdowns such as this



On untreated drill steels corrosion sets in early around the flushing hole, wearing out the steel before its time.

Corrosion has been responsible for the premature breakdown of untold numbers of drill steels. Now, from Sandvik, the world's largest manufacturers of integral steels, comes a new 'Coromant' steel well and truly protected against it. Those who have already tried out Coromant SR-treated steels report that their resistance to corrosion lengthens their life up to 50%.

At no extra cost to you, all new Sandvik Coromant steels—flushing holes as well as the outsides—have been subjected to an anti-corrosion treatment which protects the steel during transport, storage and actual drilling. (It is worth noting that the treatment of the flushing hole has been done in such a way that the diameter of the hole is the same as before, so retaining full and effective flushing and a maximum rate of drilling).

To complete the protection of the steels during transport and storage, Sandvik Coromant SR-treated steels are fitted with air-tight plastic caps on both the bit and collar.

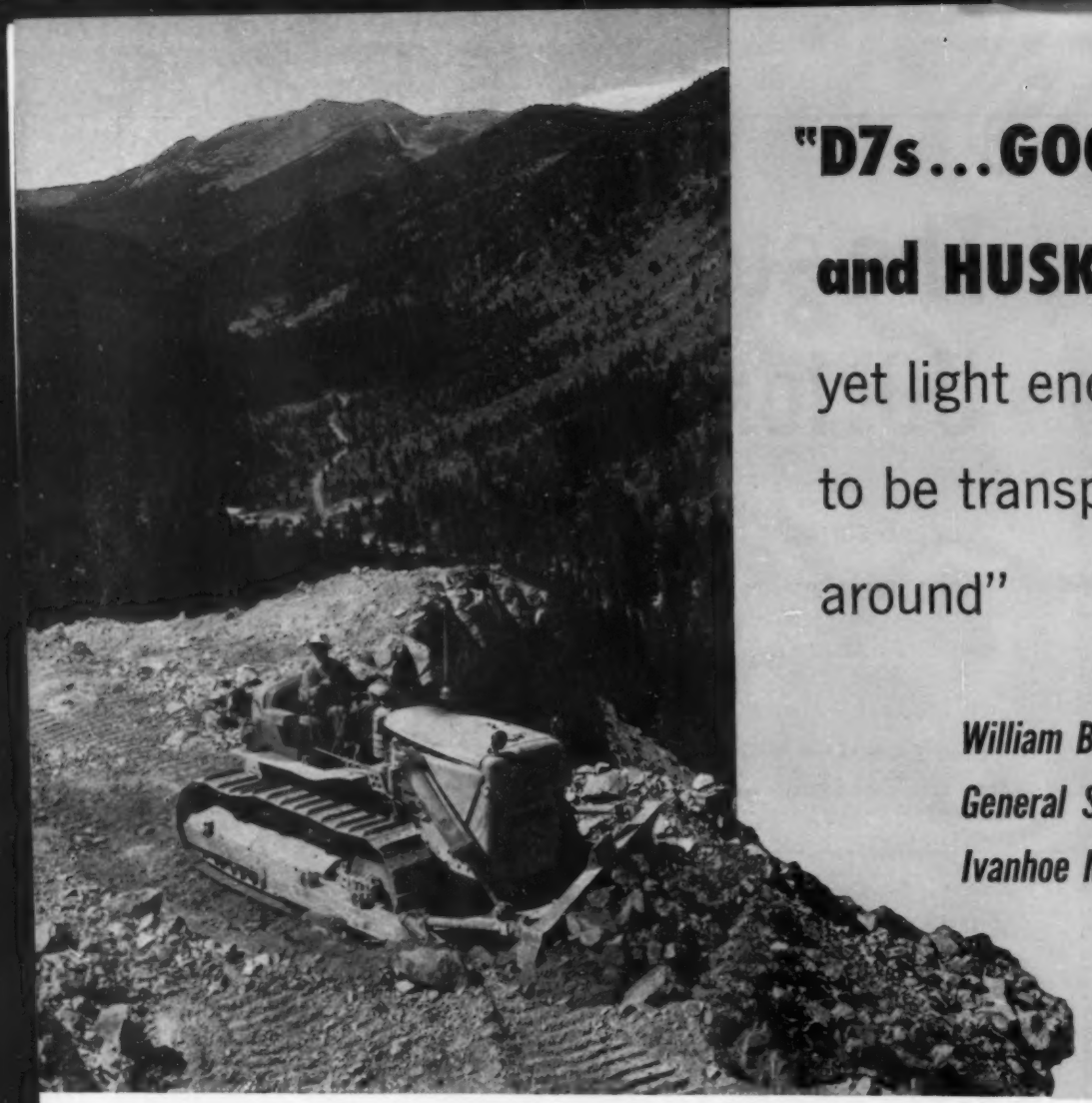
Sandvik Coromant SR-treated steels are another step towards lower drilling costs. When fitted to an Atlas Copco rock drill you have an unbeatable drilling unit, for both were developed to work together. No drill or steel developed separately could ever give such equivalently high performances. In ten years Atlas Copco drills and Coromant steels have become the world's most widely used drilling unit, responsible for the drilling of no less than one billion feet per year.

Sandvik Coromant SR-Treated Steels

Write, phone or cable today for further details to any of the addresses below:

Atlas Copco

EASTERN *P.O. Box 2568 Paterson 25, N.J.* PACIFIC *930 Brittan Av, San Carlos, Calif.*
CANADA *Montreal Airport, Quebec.* MEXICO *Apartado Postal 56, Torreon, Coahuila.*



"D7s...GOOD and HUSKY, yet light enough to be transported around"

William B. Tobey
General Superintendent
Ivanhoe Mine

Two durable CAT* D7 Tractors put in a full 16 hours of productive work each day at Ivanhoe Mine, near Glen, Montana. Here are some of the jobs assigned to these rugged workhorses:

ONE—They strip limestone overburden

TWO—They feed overburden to shovels

THREE—They clear large, granite boulders from ore

FOUR—They clean up ore after blasting

"The D7s," says William B. Tobey, general superintendent, "are good and husky, yet light enough to be transported around. They do a good job in the pit and in rock . . . they do better than any other type of equipment we could use."

Tungsten has been mined since 1952 at Ivanhoe Mine, owned and operated by the Montana Tungsten Division of Minerals Engineering Co. Production is about 850 tons of ore a day with a two-to-one ratio of overburden to ore. Elevation of the mine is 7,000 feet.

The D7 is designed to give you top production no matter what the climate, elevation, season or job. Rated at 128 HP (flywheel), its four-cycle diesel engine gives you a longer power stroke resulting in smoother, more efficient operation than in two-cycle engines. Fabricated steel steering clutch case and frame unit, hardened precise-machined transmission and final drive gears and the Caterpillar oil clutch make these tractors ideal for rugged mining duty.

Your Caterpillar Dealer backs every tractor with quick, efficient service and quality factory parts. Call him and name the date—he'll demonstrate on *your* job.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—THE HARD WORK

Mining World

***Including the Export Edition* WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 19 **JULY 1957** **NO. 8**

OPERATIONS—TECHNOLOGY

Milling

How and Why Climax U_3O_8 Uses Solvent Extraction **44**

By George O. Argall, Jr.

Climax Uranium, one of the first Plateau uranium plants to use solvent extraction, has found it to be very satisfactory because higher costs are lower, mill control is simplified, much higher recovery, a high grade concentrate is produced, and circuit is flexible. Special glossary on solvent extraction is included.

Mining

Punched Cards Are Key To Homestake's Mine Costs **50**

Punched cards have become the foundation for payroll calculation at Homestake's South Dakota operations. Important by-product data recorded on punched cards provide the information required to post operating and general ledgers.

Selective Mining For Arizona Asbestos **54**

By D. W. Jaquays and Alvin W. Gerhardt

Strategic asbestos, mined on the south rim of the Salt River Canyon, averages about $21.00 per ton. The ore is hand sorted at the mine to a value of $164.50 per ton, and milled at Globe, Arizona with a resultant production of a fiber concentrate valued at $573.00 per ton.

Congress

Long Range Minerals Program Reaches Congress **59**

Interior Secretary Seaton announces plan for lead, zinc, beryl, chromite, and tantalite-columbite. At Congressional hearing he outlines present government thinking on programs to be developed for other metals.

European Mining Equipment

International Trade Fair Features Mining Equipment **64**

The latest in international mining equipment was featured at the Trade Fair recently held in Hanover, Germany. Read the special report for possible United States application of equipment exhibited.

Recognition to World Mining

Industrial Marketing has honored World Mining for "Editorial Excellence with a 1957 Award of Merit." **13**

IN THE NEWS

Northwest News **79**
Central Eastern News **89**
Rocky Mountain News **83**
Southwest News **92**
International News **97**

DEPARTMENTS

Letters to the Editor **3**
Money Making Methods **62**
Drifts and Crosscuts **5**
U. S. Personalities **75**
Capitol Concentrates **7**
International Newsmakers **77**
Fission Facts **11**
Metal and Mineral Prices **107**
International Panorama **43**
Production Equipment Preview ... **66**
Advertiser's Index **114**

ON THE COVER

Selective mining of two asbestos-bearing serpentine horizons, 4 feet apart at the Regal mine, requires separate blasting of ore and waste to prevent undue dilution. Wherever possible waste is used as backfill for room and pillar stopes to prevent excessive roof sag. Gardner Denver airlegs are used for stope and drift work.

READERSHIP

RESEARCH

MILLER FREEMAN PUBLICATIONS

GRAB SAMPLES From the Mail

Who found El Salvador?

Dear Sir:

"For the 'sake of the record,' I am submitting the following data to you in the hope that you will print it in the Mining World.

"Recent articles, published early in 1955 in various newspapers, technical journals, and at least one national news magazine, have given incorrect versions of the finding of the important Indio Muerto (now called El Salvador) copper deposit near Potrerillos, Chile. *Time* magazine, for example, stated that Indio Muerto was 'discovered and recognized by Anaconda geologist William Swayne.' Again, a review in the February, 1956, issue of *Mining Engineering* infers that the 'steep slopes of Indio Muerto peak' received their first serious geologic examination in February 1950, by V. D. Perry and W. H. Swayne. To correct these versions, I am giving below a summary of as much as I know concerning the history of this property.

"First, credit for the discovery of the deposit itself is due to the ancient Incas, who worked turquoise diggings only a few kilometers away from the main surface exposures of oxidized copper ore. Second, the partial recognition of the importance of the deposit should be attributed to some unknown miner, for someone began rather small-scale but undoubtedly profitable mining of the property years ago, perhaps before 1900. Almost certainly, through the years quite a number of mining men, including engineers, examined the area; and—since the oxidized ore showings are fairly impressive and since the surrounding region is highly iron-stained—probably experienced varying degrees of enthusiasm. José del C. Fuenzalida, of the Chilean Bureau of Mines, examined it briefly in 1909. The first investigation for Anaconda, that of I. L. Greninger in 1922, concluded that the deposit had chances of containing several million tons of ore.

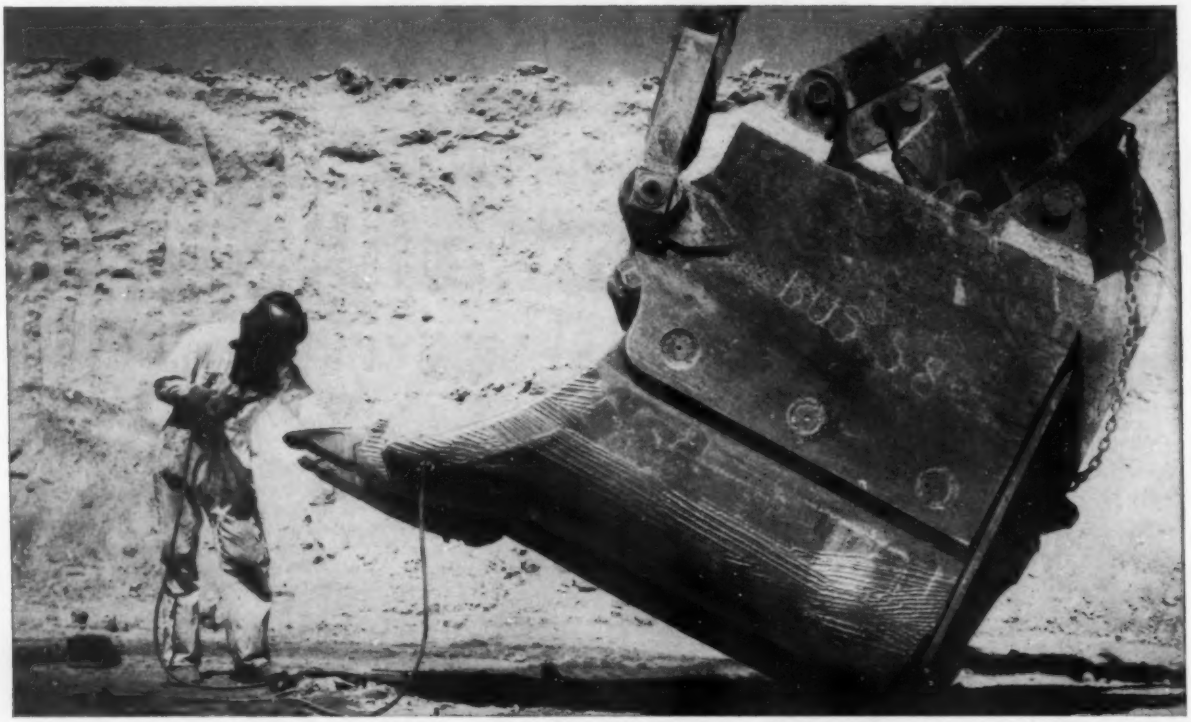
"Categorically, however, I believe that it was not until August 1942 that the deposit was recognized as having possibilities of being a large disseminated deposit of 'porphyry copper' size. This recognition developed through a one-day visit at the property by a party of four men: W. S. March, Jr.; E. F. Reed; Sam Watson, Jr.; and myself. March, as chief geologist for Chuquicamata and newly appointed consulting geologist for Potrerillos, headed the group. At that time, Reed was chief geologist and mining engineer for Potrerillos; Watson was assistant geologist at Potrerillos; and I had recently been transferred from Chuquicamata to take over the geologic portion of the geology-engineering job that Reed was leaving at Potrerillos. Thus all of us, in varying degrees, were experienced in the technique of the interpretation of leached outcrops through diagnosis of limonite boxwork types, etc.

"Arriving at the property, we were of course first impressed by the obvious but rather limited area that has veined zones and disseminations of brochantite and other oxidized green copper minerals at the surface. In examining closely specimens of the adjacent barren but iron-stained areas, we recognized the possi-

Continued on page 108

MINING WORLD, July, 1957. Volume 19, No. 8. Published monthly except April, when publication is semi-monthly at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 500 Howard Street, San Francisco 5, California. Subscription in United States, North, Central, and South America, $3.00 per year; other countries, $4.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under the act of March 3, 1879. Postmaster: please send notice 3579 to MINING WORLD, 500 Howard Street, San Francisco 5, Calif.

How STOODY HARD-FACING *keeps* STRIP MINING EQUIPMENT *on-the-GO!*

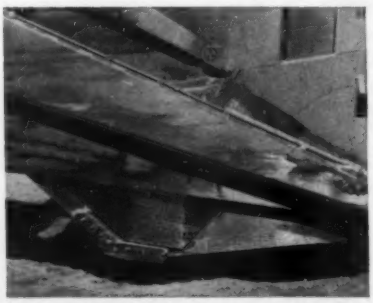


A few beads of Stoody Electric Tube Borium *keep the points of these shovel teeth out to size, while unprotected teeth lose a full inch of length in the same time.*

Heavy earth moving equipment used in open pit operations lasts far longer and requires fewer replacement parts when wearing surfaces are hard-faced with Stoody alloys. The illustrations show typical examples of both manual and semi-automatic applications. For top welding speed—2 to 4 times faster than manual welding—use Stoody semi-automatic tubular alloy wires... to speed maintenance during short down periods and between shifts, to save time and cut over-all costs.

Ask your Stoody dealer for a free copy of the Stoody Guidebook and the Semi-Automatic Wire folder; this literature covers hard-facing recommendations for all types of heavy equipment. Check the "Yellow Pages" of your phone book for local distributors—or write direct.

Parallel beads *of Stoody 100 are run along bed of dump trucks to reduce wear in these areas. Material packs between beads, further reducing wear.*



Cutters and sides of scrapers *are subject to severe wear. Semi-automatic application of Stoody 100 provides protection.*

Shovel teeth *are first hard-faced as shown with Stoody 100 by the semi-automatic welder. Points are touched up manually during lunch time and at end of shift with 3/16" Stoody Coated Electric Tube Borium.*

Ripper teeth *have wearing surfaces hard-faced semi-automatically with Stoody 100. 1 or 2 beads of Tube Borium hold points to size.*

STOODY COMPANY

11969 East Slauson Avenue

Whittier, California

Mining World

EDITORIAL AND EXECUTIVE OFFICES
500 Howard Street
San Francisco 5, Calif.
EXbrook 7-1881

General Manager .. M. F. Holsinger
Editor ..... George O. Argall, Jr.
Associate Editor .... Stanley Dayton
Mgr., Eng. Serv. .. H. G. Grundstedt
News Editor ..... Janet M. Taylor
Ass't News Editor L. A. Charbonneau
Product Editor ..... C. F. Hamilton
Production Manager . J. A. Cheesman
Circulation Manager ... C. C. Baake

New York City Office
370 Lexington Avenue
Murray Hill 3-9295
Dist. Mgr., New York .. A. E. Roberts

Chicago Office
1791 Howard Street
Rogers Park 4-3420

Dist. Mgr., Chicago ... R. N. Crosby

Vancouver Office
402 Pender St. West
MArine 7287

Assoc. Editor ..... Charles L. Shaw

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia. **Asia**—Ankara, Turkey, Kuala Lumpur, Federated Malay States; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. **Europe**—London, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Redruth, Cornwall. **North and Central America**—Mexico D. F., Mexico; Vancouver, British Columbia. **South America**—Sao Paulo, Brazil; La Paz, Bolivia; Lima, Peru; Bernal, Argentina. **Oceania**—Port Kembla, N. S. W., Australia; Manila, Philippine Islands.

Not responsible for unsolicited manuscripts. Contents may not be reproduced without permission

Published by American Trade Journals, Inc.
Wm. B. Freeman, President
L. K. Smith, Vice President
Miller Freeman, Jr., Sec-Treas.
WORLD MINING is published the 26th of each month as a regular department of MINING WORLD and is also circulated as a separate publication on a carefully controlled free basis to a selected list of management and supervisory personnel associated with active mining enterprises throughout the world.

Mining World Subscription Rates
U.S., North, South and Central America $3.00
Other Countries $4.00
Single Copies .....$ .50
Directory Number $1.00

CHANGE OF ADDRESS:
Send subscription orders and changes of address to MINING WORLD, 500 Howard St., San Francisco 5, Calif. Include both old and new addresses and zone numbers.

Copyright 1957 by American Trade Journals, Inc.

Drifts and Crosscuts

Mining World Opens European Headquarters

Max F. Holsinger, general manager of Mining World, is now in Europe where he will establish headquarters for the purpose of improving and expanding Mining World services to readers. Mr. Holsinger has gained a wealth of information on foreign mining and practices during his previous two European trips which will be most helpful in analyzing present conditions and trends.

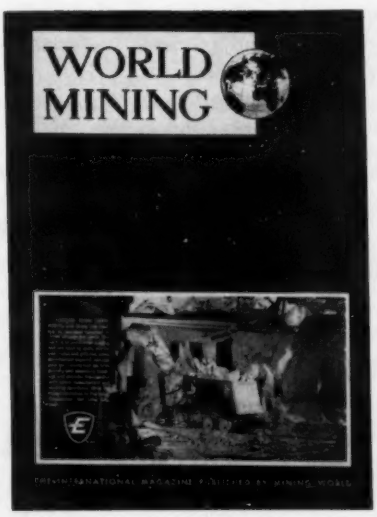
He plans to visit the most important European and African mining and metallurgical operations and will attend the International Mineral Dressing Congress in Sweden in September. During these inspections he will have the opportunity of observing the latest European technical methods and machinery developments. Reports on these developments will appear in future issue of Mining World.

Of special interest will be the iron ore beneficiation plants in Scandinavia; the developments in all types of rock drills, bits, and hole patterns in northern Europe; and underground conveyor systems in Germany. He will also visit the large German open-pit mines where bucket wheel excavators are used because United States mining companies are presently evaluating their applications for large-scale stripping.

Other studies and reports will cover equipment marketing and export methods of principal United States and European manufacturers, including the trend toward increasing licensing arrangements between manufacturers in various countries. Major consideration will be given the field of ore and mineral marketing.

Mr. Holsinger's headquarters address in Europe will be announced shortly.

WORLD MINING Has New Look



Only a few of the readers of Mining World have ever seen a copy of World Mining. This is because it is the International Edition with distribution to all and every mining camp outside the United States.

Those readers who have worked or travelled outside the United States, and there are many of you, know World Mining as the most widely read and quoted technical mining magazine.

For those of you here in the United States, and the ever growing number of you that are travelling to Canada, Mexico, Mozambique, Malaya, or anywhere, here is what World Mining looks like now. Read it when abroad and you will think you never left home.

Out where performance alone is not enough!

Near Butte, Montana, a CAT* DW20 Tractor works on a haul road at an open-pit copper mining operation. The road, half a mile long and 60 feet wide, had to go in fast. So a pair of DW20s with Scrapers dumped some 1600 cu. yd. of dirt per 8-hour day, and did it day in, day out till the job was done.

And that's the point: *day in, day out* till the job is done. For, on the hard jobs, performance alone, while mighty important, is not enough.

Sure, DW20 units give superior performance. Big capacity. Load easily. Big rimpulls that overcome grade and rolling resistance on rough roads. Ejection that gets rid of any kind of material quick. And, of course, high speed.

But the DW20 does more than a good job. It *stays* on that job. It shrugs off the down time that hurts you in your cost-per-yard figure. Your Caterpillar Dealer is ready with facts and figures to prove that the built-in durability of the DW20 means dollars and cents to you. He's ready, too, with expert service—and with replacement parts you *know* you can trust.

P.S.: Your Caterpillar Dealer will demonstrate the DW20 on your job, at your say-so—with any of its famous running mates: the new No. 456 Scraper with LOWBOWL design; the Athey PH20 Wagon specifically designed as an economical coal hauler (56 cu. yd. heaped load); and the Athey PD20 side dump Wagon with a heaped capacity of 25 cu. yd.

Caterpillar Tractor Co., San Francisco, Calif.; Peoria, Ill., U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK

Capitol Concentrates

"Long-Range Minerals Program" Is Not Long Range; Only Few Minerals Covered

Some years ago the President's cabinet-level Minerals Policy Committee labored for about 18 months and came forth with a number of disappointing, weak, and inconsequential recommendations. Now, after several years, the Administration through Secretary of the Interior Seaton has presented an alleged long-range minerals policy which is reviewed elsewhere in this issue.

It will be noted that the program, as an actual fact, only covers lead and zinc and, what is more amazing, the proposals for lead and zinc are for tariffs of a similar nature to those in the Simpson bill which the Administration went all-out to defeat a few years ago. Whether the figures in this tariff proposal are realistic or not will come out in hearings before the House Ways and Means Committee. The rumors are that industry was not consulted.

There is no immediate relief proposed for any segment of the domestic mining industry, and only four other minerals are covered at all in the "long-range" program.

The suggestion is made that the U.S. Bureau of Mines and the United States Geological Survey continue the work that the public has been paying them to do for years. It is suggested that DMEA continue its exploration programs. In passing it may be noted that no one in his right mind will match funds with DMEA if he is a small outfit which needs immediate returns. There is no use exploring for minerals you cannot peddle and for which the government has no program. The well-financed company can relieve its exploration fund by joining in the DMEA program as it can hold the property until conditions permit profitable operations. Many already are doing this. Anyway, there is nothing new about DMEA and it could be abolished overnight. The third general proposal is that "A continuous review of the tax laws as they affect the mining industry should be maintained. No revisions in the laws are recommended at this time." A big help!

Under the heading of "Special Assistance Recommendations" Secretary Seaton states, "The department will continue its support of the program under Public Law 733 (84th Congress) until the new programs . . . are in effect." And well it might as Interior recommended and practically wrote P. L. 733 to subsidize tungsten, acid grade fluorspar, columbite, and asbestos. How it will support the program unless the Department of Interior is voted money for purchases is not mentioned. That monkey, apparently, is put on Congress' back.

The beryl program is mentioned, and selected for a "production bonus" of $70.00 per short ton (10 per cent BeO) for domestically produced concentrates. This payment would be too little now to stimulate production, but the program is scheduled to start July 1, 1962, after the present ODM program runs out. What kind of a crystal ball does the Secretary have to set a bonus price for 1962? And who will authorize it and furnish the money?

The same questions apply to the proposed chrome program which is to carry a "production bonus" of $21.00 per long dry ton (46 per cent basis) and which is to begin July 1, 1959. The quota under the present ODM chrome program is already well on the way to being exhausted. Who will authorize this new program, where is the money coming from, and will $21 be the right figure in 1959 when it is too low now?

A columbite program is proposed with a bonus of $2.35 per pound and, upon "inauguration" of this program, the P. L. 733 program would "terminate." Who will make the determination is not stated.

The real clincher is asbestos. Secretary Seaton does not propose to buy it, nor does he propose a production bonus. He proposes to loan money to the Indians on the San Carlos Reservation ("exploring the possibilities" is the term used) to build a mill, to be repaid "out of operations".

Nothing is said about copper, tungsten, cobalt, antimony, or scores of other minerals, in this "comprehensive, long-range program" calculated to cure the ills of domestic mining forevermore.

• Morse Proposal Will Stir Up Opposition

Senator Wayne Morse of Oregon is planning to introduce a bill which is sure to bring forth strenuous opposition from the mining fraternity. His bill will call for a complete separation of the surface and the sub-surface upon the patenting of a mining claim located after enactment of the measure. It also will make provision for the government to return the purchase price of a patent to a mining patentee should he desire to relinquish his patent .

Senator Morse is advocating the change on the theory that retention of surface rights by the government would make possible continuance of sustained-yield forestry and surface management, and would reduce right-of-way problems so that the timber, mining, and grazing industries would be able to secure access to other federal lands.

When the mining industry agreed to provisions of Public Law 167, which separated the surface and sub-surface rights prior to patenting, it made a major concession to the multiple-use theory. To continue that separation following patenting, they say, strikes at the very heart of the mining laws and would be a mortal blow to prospecting and small mining.

• Some Aspects Of Gold Problem Explained

Because so much misunderstanding exists about the real legislative situation regarding gold, the fol-

Continued on page 9

Ski lift operators stress safety when it comes to buying wire rope. Too many lives are at stake. So they buy . . .

A Safe Lift

Even though you don't operate a ski lift, false economy can be costly in your rope purchases, too. For a rope failure can cause personal injury . . . wreck your equipment . . . throw off your entire work schedule . . . and affect employee morale. Yes, a "bargain" wire rope may save you money, yet cost you your peace of mind. Don't take a chance. Buy a rope that's a quality rope—buy Wickwire Rope.

WICKWIRE ROPE
A CF&I PRODUCT

CF&I

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

5050

THE COLORADO FUEL AND IRON CORPORATION — Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION — Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans
New York • Philadelphia

lowing information may of interest to our readers.

The law specifies that it shall be the duty of the Secretary of the Treasury to maintain all forms of money issued or coined by the United States at parity with gold at $35.00 per ounce. The Secretary of the Treasury maintains United States money at parity with the gold dollar (15 5/21 grains 9/10 fine) by freely buying gold from, and selling gold to, foreign governments and central banks for legitimate monetary purposes, and by selling gold to authorized persons in the United States for industrial, professional and artistic uses at the official price of $35.00 per fine troy ounce (plus or minus handling charges). The United States mints and the assay office also stand ready to purchase gold from authorized domestic holders at the same $35.00 price. (less handling charges).

Under a free market, there would be two alternatives: The United States government either would stay out of the market, thus permitting the existence of variable prices for gold in terms of the dollar, or it would stand ready to buy and sell gold at the official price to prevent such fluctuations. The second alternative would be, in effect, full convertibility of the dollar into gold.

With respect to proposed legislation which would increase the price of gold, the United States has an international obligation, contained in Article IV, Section 2, of the Articles of Agreement of the International Monetary Fund, not to buy gold at a price above the par value of its currency (plus a prescribed margin of one per cent) or sell gold at a price below par value (less one per cent). The United States has set a par value for the dollar of 15 5/21 grains of gold 9/10 fine. Accordingly, an increase in our official price of gold would necessitate a change in the par value of the dollar in order to fulfill our obligation to the International Monetary Fund. Section 5 of the Bretton Woods Agreement Act requires the authorization of the Congress for any such change in the par value of the United States Dollar.

The above, in brief, is the technical situation. In addition, the Treasury is bitterly opposed to any attempt either to create a real free market or to change the price of gold, claiming it would be inconsistent with our sound money policy and with maintenance of our international gold bullion standard.

• Senate Passes Phosphate Acreage Bill

The Senate on May 8, 1957, passed by unanimous consent the bill to double the phosphate lease acreage in any one state. The total area (10,240 acres) which can be held by any one company is not changed, but under the Murray bill the entire acreage may be held in one state. This bill passed the Senate last year, was favorably reported by the House Interior Committee, but was lost in the House during the closing days of the session, never coming to a vote.

• Budget Report Gives Mineral Inventory

The following from the fiscal 1958 budget report may give a clue to the difficulty being encountered in securing Congressional approval of new or extended mineral purchase programs:

"Inventories of minerals and metals (stated at cost) are expected to increase from $567,300,000 in 1956 to $709,200,000 at the end of 1958. The inventories at the end of 1958 represent the accumulation by the government of such materials as titanium ($141,000,000), tungsten ($260,000,000), manganese ($77,300,000), chromite ($19,600,000), and columbium ($48,600,000). This material is held by the government in this account because it cannot be absorbed within existing stockpile objectives and there is no current industrial need for the material in the economy."

• Barter Program Causes Worries

It appears that Secretary of Agriculture Benson is afraid Congress will not give ODM enough money to take barter minerals off his hands or to reimburse the Commodity Credit Corporation. Also, he does not like the notion that barter might increase mineral prices so he would not get big enough bargains. He can't feed manganese for school lunches, either, if he is stuck with it. On the other hand the State Department is said to be objecting on the basis that barter may be interfering with cash transactions. And so it goes!

• Bennett Given Interior Department Appointment

The appointment of Elmer F. Bennett to the post of Solicitor to the Department of the Interior is said to be a particularly happy one. He is a Westerner, born in Colorado, has had a good deal of Congressional experience, having been at one time an assistant to former Senator Millikin of Colorado, and is thoroughly familiar with western problems. Bennett is well liked by the members of both Houses of the Congress and is, according to Washington observers, most cooperative.

Bennett has been with the Department of the Interior since 1953, first as a special assistant to the solicitor and legislative counsel for the department, then (since June 1956) as assistant to the Secretary of the Interior. Other activities include employment in management and planning work by the Ordnance Department of the U. S. Army during World War II, and as trial attorney in the anti-monopoly field for the Federal Trade Commission.

COMING CONVENTIONS

July 14, 15, and 16. The 54th Annual Convention of the IDAHO MINING ASSOCIATION, Sun Valley, Idaho.

September 8, 9, 10, and 11. Sixth Commonwealth Mining and Metallurgical Congress, Vancouver, British Columbia. Additional meetings will be held in seven other Canadian cities ending at Halifax, Nova Scotia, October 9. Field trips to many Canadian districts will form an important part of Congress.

September 9 to 12. Mining convention of the AMERICAN MINING CONGRESS, Salt Lake City, Utah.

September 18 through 21, 1957. INTERNATIONAL MINERAL DRESSING CONFERENCE, Royal Institute of Technology, Stockholm, Sweden.

October 15 through 18. SOUTHEASTERN STATES MINING CONFERENCE and the ANNUAL MEETING OF THE SOCIETY OF MINING ENGINEERS, Hillsboro and Tampa Terrace Hotels, Tampa, Florida.

October 30 and 31, November 1. Fourth annual ROCKY MOUNTAIN MINERALS CONFERENCE, sponsored by the AIME. Cosmopolitan Hotel, Denver, Colorado.

November 2 through 8. Second WORLD METALLURGICAL CONGRESS, Chicago, Illinois.

A Size for Every Need...

in the only *Complete* Trailer Line

Athey-Cat PR21-DW21 maneuvers easily in tight quarters, handles big rock.

High-speed production on long hauls with the Athey-Cat PR15-DW15 Rear Dump.

Athey Hydraulic Ejection Trailer gives positive control in dumping and spreading loads.

45-tons to 22-tons — rear dump, hydraulic ejection, side dump, bottom dump — matched trailers for Cat DW21, DW20 and DW15 Tractors — *only* Athey offers you this complete line of capacities and types of high-speed haul units.

Whether it's big rock, clay, ore, mud or earth you have to move, there's an Athey Trailer matched to your mining operations.

The most complete materials handling trailer line is built by Athey — the leader in the trailer field for more than 34 years. Each unit is built to the rigid standards of quality construction that mean longest life and low maintenance.

This is why Athey Trailers lead the field in big production, fast dumping, easier loading, more profits. Ask your Athey-Caterpillar Dealer for information on the complete line today.

ATHEY PRODUCTS CORPORATION, 5631 West 65th Street, Chicago 38, Illinois.

ATHEY TRAILER FACTS . . .

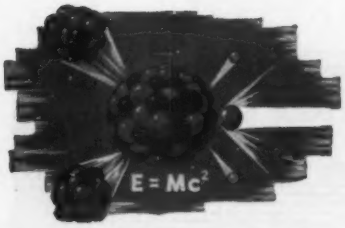
Trailer-Tractor	Capacity
Athey PR21-Cat DW21	34-tons, 22.5 cu. yds.
Athey PR20-Cat DW20	34-tons, 22.5 cu. yds.
Athey PR15-Cat DW15	22-tons, 15.6 cu. yds.
Athey Hydraulic Ejection-Cat DW21 (or DW20)	31-tons, 22.5 cu. yds.
Athey PD20-Cat DW20	30-tons, 22 cu. yds.
Athey PH20-Cat DW20	45-tons, 62 cu. yds.

THE *Complete* TRAILER LINE... *by the Leader*

Athey

Just off the press — describes complete Athey Trailer line. Write today.

SEND FOR TRAILER BOOKLET



FISSION FACTS

Monthly Roundup of Mining News In the Atomic Energy Field

Russia Seeks To Develop New Domestic Sources Of Uranium While Exhausting Satellite Supply

This special report by MINING WORLD's London correspondent reveals the chief sources of uranium ore in the Soviet orbit as known in Europe, and some production plans for the future.

The Soviet's uranium production is in five main areas: the satellites; the well-established field in the Ferghana region of the Central Asian Republics; and in three newer fields—northern Siberia, southern Siberia, and central Kamchatka.

Of these, by far the most important at present (and it will be for some years) is the Ferghana field. The ore deposits in this mountainous semi-arid region stretch over an area of 1,000 square miles. The ore is predominantly carnotite and was first mined for uranium in 1904. The uranium is found together with other valuable metals such as bauxite and vanadium.

The Ferghana field bears considerable resemblance to the Colorado Plateau of the United States. Prior to the war the extent of the workings was known to be smaller than on the Colorado Plateau, but it seems certain that since that time new discoveries have considerably increased production. Some sources estimate that well over 50 percent of current Soviet production comes from Ferghana.

Less is known about the three newer areas, but a good deal can be inferred from their geology. Uranium occurs predominantly in two geological regions—in belts of ancient pre-Cambrian rocks, metamorphosed permeable sediments, (the Ferghana field is an example of the latter). The existence of such rocks is distinctive, either as existing or potential sources of uranium.

Two extensive areas of pre-Cambrian rocks exist in the U.S.S.R.: in northern Siberia (the Angara Shield) and in a vast area covering the whole of southern Siberia and the Mongolian Peoples Republic. Western scientists regard it as certain that extensive mining is taking place in these areas, and some sources estimate that by 1960 the Angara Shield deposits (together with the Ukhta deposits of north Russia) could easily be producing about 2,000 tons of metal equivalent a year.

A similar production figure is considered likely for southern Siberia, with the Mongolian-North China field yielding perhaps a further 1,000 tons by 1960, depending on the progress of the development of production facilities. Intensive mining is known to be taking place in the Lake Baikal area. At Slyudyanka, for example, at the southern end of the lake, betafite deposits are mined which contain calcium, colombium, and tantalum, in addition to uranium. Uranium fields are also being worked at Ulan Ude (a little to the east of the Lake) and at Vitim, 300 miles to the north on the River Lena. Two other areas where known uranium deposits exist are at Yeniseisk and Minusinsk on the River Yenisei. The deposits in Kamchatka are thought to be extensive and annual production by 1958-1959 of about 1,000 tons is thought probable.

The satellites will probably produce about 800 tons (13 percent) of the total Soviet production during 1957. Of this, East Germany and Czechoslovakia should produce about half, and Bulgaria, Rumania, and Hungary the remainder.

The famous pitchblende ores found in the Joachimstahl area of Czechoslovakia (where uranium was identified at the end of the 18th century) are now believed to be nearing exhaustion, but the decrease there has probably been offset by the discovery of other deposits in other neighboring areas. Similarly, the Erzgebirge deposits in East Germany are probably nearing exhaustion, and mining is being intensified in the Zwickau-Annaberg area, where extraction began in 1946 after deposits had been found by a Soviet geological team.

Other active mining areas in East Germany are in Southwest Saxony and East Thuringia which were discovered in 1943. East Germany is certainly the biggest single producer among the satellites and according to some West German sources has supplied the Soviet Union from 1945 to 1954 with enough uranium for about 44 atomic bombs.

Production in the satellites will assume less importance as production in the newer fields in Russia grows. The Soviet aim seems to be to work the mines in the satellites to the point of exhaustion in the shortest possible time to guard against the possibility of those countries breaking away from Soviet control with considerable deposits of uranium still unmined.

U_3O_8 Prospect Permits To Be Issued Jointly

The Atomic Energy Commission and the Department of Interior have worked out a cooperative arrangement for the issuance of uranium prospecting permits and mining leases on government lands under the jurisdiction of other federal agencies not having authority to issue such permits and leases. The Department of Interior's Bureau of Land Management will assist the Atomic Energy Commission in administering the new procedure under a regulation issued by the AEC.

Affected by this regulation are lands located in various sections of the United States, such as military reservations and reservoir areas. Not affected are public lands open to mineral entry under the mining laws and lands under AEC control subject to lease under a regulation issued in 1956. Permits and leases will not be issued under this regulation for lands administered by the United States for national parks, monuments, or for wildlife purposes.

The Bureau of Land Management will receive and process applications on behalf of the Commission, and the Commission will approve and issue permits and leases. In reviewing applications, consideration will be given to the responsibilities and functions of government agencies having administrative control over the lands.

Applications should be filed in the Land Office of the Bureau of Land Management for the state where the land is situated. In states where there are no land offices, applications may be forwarded to the Director, Bureau of Land Management, Washington 25, D. C., except applications for lands in the following states which should be filed as follows: North and South Dakota, Land Office at Billings, Montana; Nebraska and Kansas, Land Office at Cheyenne, Wyoming; Oklahoma and Texas, Land Office at Santa Fe, New Mexico.

AEC Puts Surplus V_2O_5 Up for Periodic Sale

A a result of the U. S. Atomic Energy Commission's buying contracts for uranium and vanadium in the Colorado Plateau area, the Commission has on hand at Grand Junction about 4,250,000 pounds of used vanadium pentoxide (V_2O_5) which has been determined surplus to the needs of the government. This V_2O_5 is contained in the vanadium concentrate packed in 30-gallon steel drums.

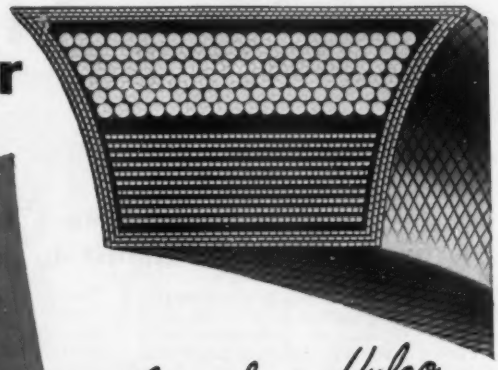
A sales program has been developed whereby about 500,000 pounds of contained V_2O_5 will be offered for sale at intervals of four to eight months, depending upon market conditions. The Commission has been working closely with the Business and Defense Services Administration, Department of Commerce, to determine how much V_2O_5 should be sold at what intervals to avoid significant impact on commercial markets as well as to obtain the best recovery for the government. After each offering, with the continued assistance of BDSA, the AEC will make whatever adjustments seem necessary to the sales program.

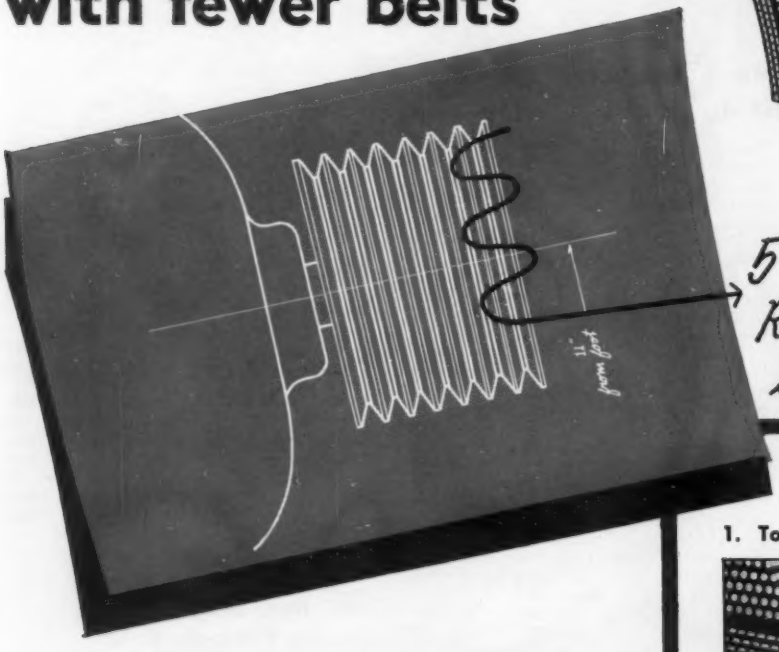
The AEC does not intend to sell any V_2O_5 at a price that does not bear a reasonable relation to the present market price for carload sales, which its studies indicate have been averaging about $1.22 per pound fob Grand Junction. This average price does not include sales under term contracts and for less than carload lot sales, which have been averaging lower and higher, respectively.

The first offering was made June 5, with bids to be received at Grand Junction by 2:00 p.m., July 5. Copies of the invitation to bid and further information may be obtained from the Manager, Grand Junction Operations Office, Atomic Energy Commission, Grand Junction, Colorado.

Cut sheave width and weight...

get same horsepower with fewer belts





5 Gates Super Vulco Ropes do the work of 7 standard V-belts

Where space is limited and weight a factor, design your drive with this important fact in mind:

5 Gates Super Vulco Ropes do the work of 7 standard V-belts

That's because a Gates Super Vulco Rope has 40% more horsepower capacity — delivers more horsepower per dollar invested than any standard V-belt drive. Sheaves with fewer grooves cost less . . . weigh less . . . take less room. Drive design is invariably improved.

A wealth of drive data is quickly available to you. Simply call your nearby Gates distributor for a Gates V-belt specialist. Stocks carried in industrial centers around the world.

The Gates Rubber Company
Denver, Colorado

GATES Distributors are in the Yellow Pages

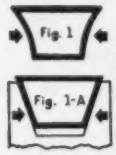
The Mark of Gates Specialized Research

No other V-Belt has ALL these advantages

1. Tough, resilient Tensile Cords

Super strong resilient tensile cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required . . . save weight and space.

2. Concave Sidewalls (U.S. Pat. 1813698)



Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

3. Flex-Weave Cover (U.S. Pat. 2519590)

A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

4. High Electrical Conductivity

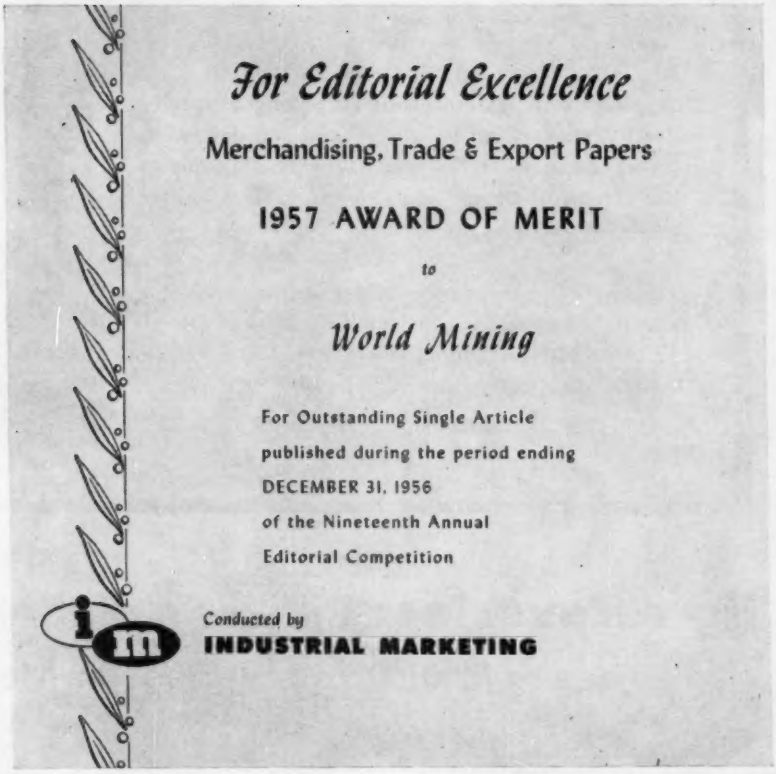
Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant

Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure to weather.

TPA 248

Gates Super VULCO ROPE Drives



World Mining Wins Editorial Award For "Outstanding Single Article"

"Editorial Excellence" in *World Mining* has been recognized by *Industrial Marketing* magazine. In its Nineteenth Annual Editorial Competition, the magazine has honored *World Mining* with the 1957 "Award of Merit" (reproduced above) for the "Outstanding Single Article" published last year in Merchandising, Trade, and Export papers.

Many of you are wondering what *World Mining* is. Actually it is the International edition of *Mining World*—abbreviated and condensed for distribution outside the United States. Please turn to page 5 to see what the magazine looks like and what it accomplishes.

The Award Winning Article, "Aerofall Mill Tests In South Africa Prove . . .", appeared in the May 1956 issue of both *Mining World* and *World Mining*.

This is the first time *World Mining* has been so honored, but *Mining World* won two previous awards in the same competition. In 1949 the award was given for "Outstanding Research." In 1950 "Round Mountain Gold" was selected as the "Best Single Article of the Year."

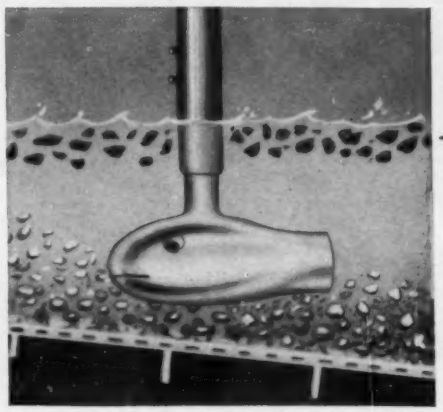
It is particularly significant that the article on Aerofall Mill Tests in South Africa was selected by a panel of eight judges. They fully realized the importance of the first report on a long and detailed series of metallurgical tests on gold and uranium ores in South Africa. While it is axiomatic that every ore is different and complete testing is a prerequisite for any commercial-scale operation the article contained a great deal of information for metallurgists in the United States. Thus they were better able to appraise the potentialities of this type of equipment for their mill circuits.

Competition was keen with a total of 653 entries in the four sections. *World Mining* was one of only three winners in its category.

Awards are fine to win. And they are challenging, too—fortunately. You have to do better next time to win another. The *Mining World* editors accept the challenge for better articles for the advancement of minerals industry technology.

Jigging stratifies materials according to specific gravity, separating solids in upward and downward pulsations of water. The heavier materials settle to the screen plate and are drawn off. The lighter materials overflow.

Jigging is an almost universal separating process for materials ranging from the specific gravity of gold at 19 to coal at 1.3. Proportions of the high-gravity materials may vary from 90% to 10% or less.



jig recoveries compare favorably with float-and-sink (heavy liquid) recoveries on Mesabi iron ores

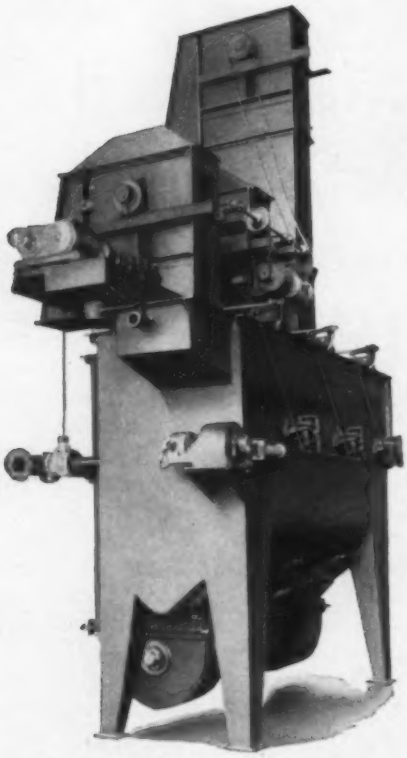


Illustration shows elevator-type jig in which high-gravity materials are withdrawn through star gates and through screen plates. An all-hutching type is also available, in which high-gravity materials are discharged only through the screen plates.

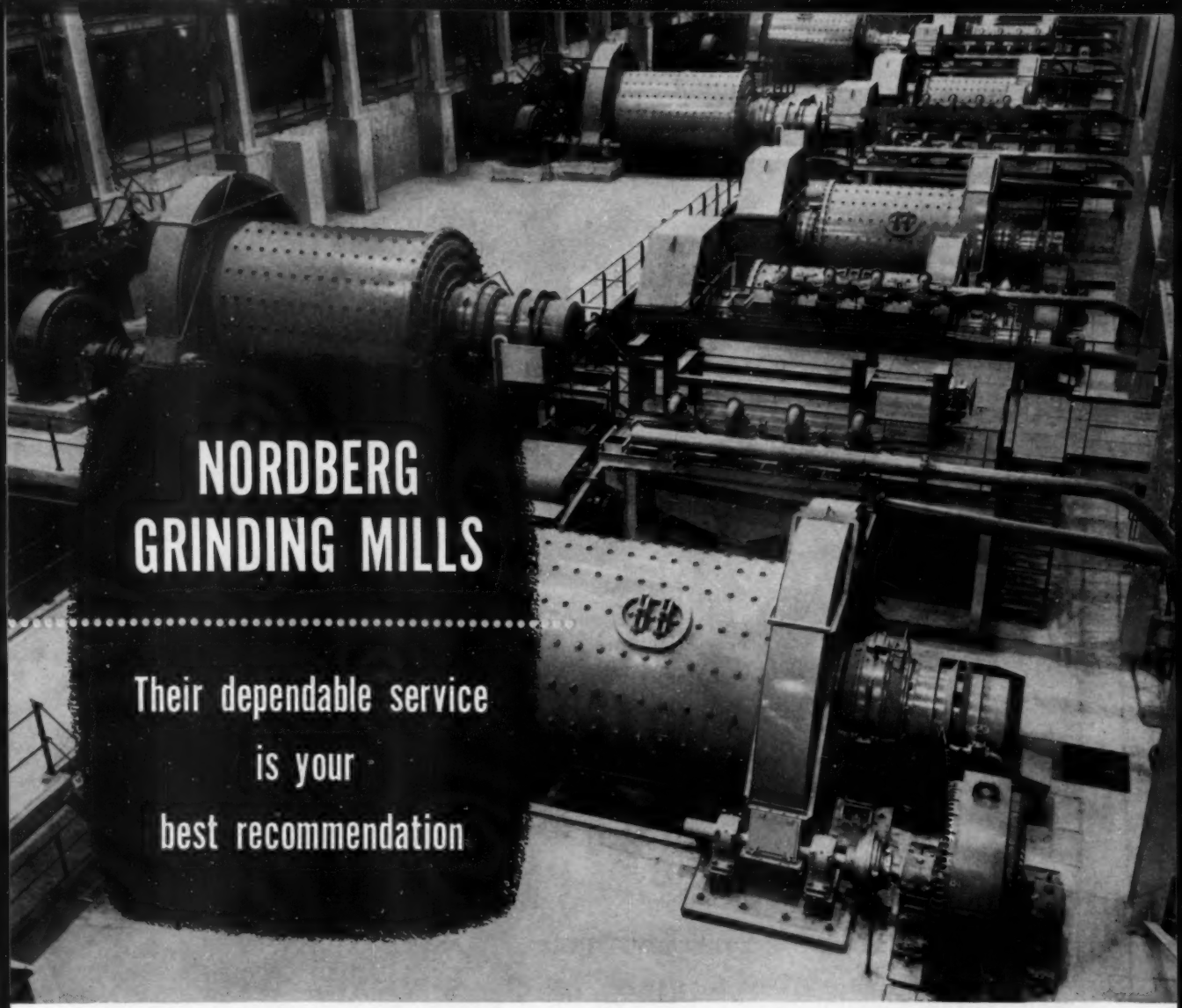
	Ore	FLOAT-AND-SINK		JIG	
		Fe, %	Recovery, %*	Fe, %	Recovery, %
All Sizes 1" x 0"	"A"	58.8	96.4	56.79	88.5
	"B"	59.9	95.3	59.53	82.7
	"C"	57.9	92.3	57.80	82.6
	Av.	58.9	94.7	58.04	84.6
+65 Mesh for F-&-S and +48 Mesh for Jig	"A"	58.8	94.8	57.83	90.7
	"B"	59.9	89.8	60.71	93.8
	"C"	57.9	89.7	58.83	88.4
	Av.	58.9	91.4	59.12	91.0

*All minus 65-mesh iron considered recoverable.

In the above tabulation, recoveries by jigging to 48 mesh are compared with possible recovery shown by float-and-sink to 65 mesh. The average figures show that the jig recovery in the + 48-mesh sizes is the same as that shown by float-and-sink down to 65 mesh. Complete technical data on these tests will be furnished upon request. Write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...
TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



NORDBERG GRINDING MILLS

Their dependable service is your best recommendation

(Above): *Four Nordberg 10½'x16' Rod Mills and eight Nordberg 10½'x14' Ball Mills installed in a large concentrating plant for the reduction of hard, abrasive "Taconite" ore.*

In the mining industry, thousands of service hours are required to prove true dependability . . . a significant reason why Nordberg Grinding Mills now are being selected for installation in many large ore reduction plants.

Nordberg Grinding Mills are designed and built for wet or dry grinding of metallic and non-metallic minerals. Sizes range from 6 to 13 feet diameter and up to 50 feet in length in Rod, Ball, Pebble, Tube and Compartment types.

Of advanced engineering and quality construction, Nordberg Grinding Mills assure trouble free and low cost operations. Consult an experienced Nordberg engineer next time you have a grinding problem. *NORDBERG MFG. CO., Milwaukee, Wisconsin.*

SYMONS . . . A registered Nordberg trademark known throughout the world

SEND FOR THIS NEW BULLETIN

This new Nordberg Bulletin 232 fully illustrates and describes the full line of Nordberg Grinding Mills for the efficient, low cost processing of ores and industrial minerals. Write for your copy today.

NORDBERG

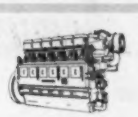
MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • ST. LOUIS • DULUTH • WASHINGTON
TORONTO • MEXICO, D. F. • LONDON • GENEVA • JOHANNESBURG

Symons Gyratory and Cone Crushers

Mine Hoists

Symons Vibrating Grizzlies and Screens



Diesel Engines

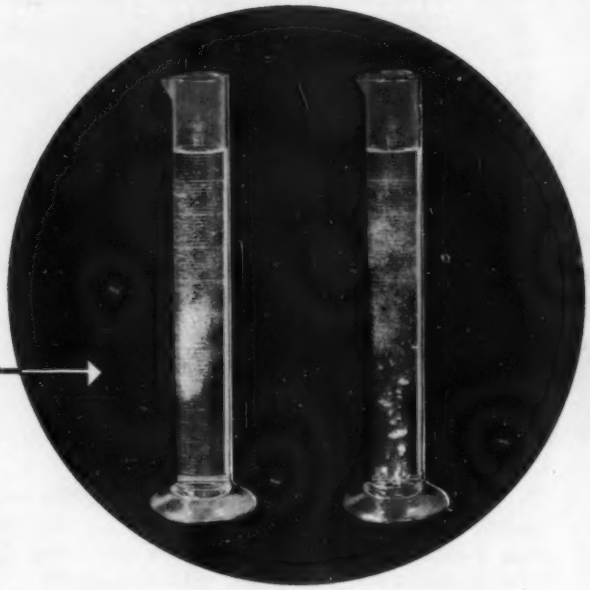
© 1957, Nordberg Mfg. Co.

GM157

Clear Colorless Solutions *Faster!*

because

Disperses and Dissolves *So Quickly*



If you use soda ash in solution, you can probably speed up your processes by switching to Westvaco® Soda Ash.

While you watch, the free-flowing, needle-like crystals of Westvaco Soda Ash disperse and dissolve . . . form a clear, colorless solution . . . 94% as clear as distilled water by electrophotometer measurement. You never need break up lumps or clods, never need remove turbidity by filtration.

Add chemical purity, less dusting and better flowability to quick dispersion and dissolution and you have five good reasons for using Westvaco Soda Ash.

We can probably give you a bigger value for your money on your Soda Ash needs. Why not talk it over with us?

fmc®

Westvaco Chlor-Alkali Division
FOOD MACHINERY AND CHEMICAL CORPORATION

chemicals

161 E. 42nd St., New York 17 • Chicago St. Louis Denver Philadelphia So. Charleston, W. Va.

BECCO peroxygen chemicals • FAIRFIELD pesticide compounds • FMC organic chemicals • NIAGARA insecticides, fungicides and industrial sulphur • OHIO-APEX plasticizers and resins • WESTVACO alkalis, solvents, phosphates, barium and magnesium chemicals

The Engineer's Field Report

CASE HISTORY
LUBRICANT *RPM Delo Oils*
FIRM *Arizona Sand & Rock Co., Phoenix, Arizona*

Sleeve taper only .0045" after 150,000 miles hauling under tough conditions

This Mack tractor's 200 h.p. Cummins diesel went in for its first overhaul after four years hauling heavy equipment to and from Arizona construction jobs. The rig hauls loads up to 25½ tons in on-and off-highway work. Using RPM DELO Special Lubricating Oil since new, inspection after 150,000 miles showed oil return holes clear, all rings free and in good condition, maximum sleeve taper only .0045". Manley Johnston, Shop Foreman, Arizona Sand & Rock Co., reported, "The engine was really clean! It could have gone at least 50,000 more miles." Arizona Sand & Rock, general contractors for road building projects and operators of a large plant, works its equipment in constant dust and grit...in desert and mountainous terrain. The company depends on RPM DELO Oils to give the protection these heavy-duty engines need under these tough conditions.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

Why RPM DELO Oils reduce wear in heavy-duty engines

Detergent keeps parts clean...helps prevent piston scuffing. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

Special additives provide metal-adhesion qualities...protect parts hot or cold, running or idle.

Anti-oxidant resists lacquer formation...prevents ring sticking.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA C[illegible] Y
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box [illegible] • El Paso, Texas

"Sunday-Punch"

The pin-point blasting that rips away the side of a hill for strip mining is just one of the many mining operations in which Simplex products play an important part. Simplex-TIREX trailing cords and cables, engineered especially for mining work, are on the job in and around mines everywhere. TIREX cables are newly improved for greater flexibility. Their cured-in-lead Neoprene Armor resists abrasion, oil, heat and water, and gives longest life.

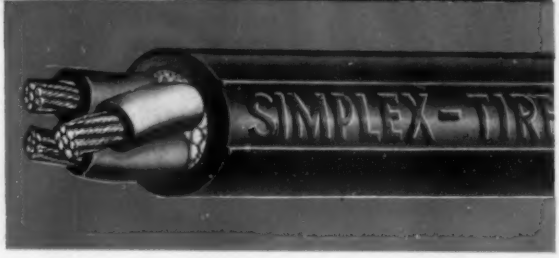
SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Massachusetts.

Wire Sculpture by Henry Szafarz

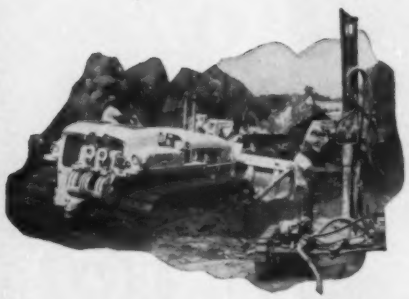
LIVE BETTER ELECTRICALLY

Simplex

TIREX



Here's why Euclid TC-12 Twin-Power Crawlers give you MORE WORK-ABILITY



With 436 hp, independent track drive and many other advanced design features, the TC-12 has set completely new standards of performance for big tractor work.

Your Euclid Dealer will be glad to provide specifications and performance data on work similar to yours.

SPEED

The TC-12 has speed—up to 7.8 mph forward or reverse—but that's not all. Pivot turns (one track forward and one reverse at the same time) plus changing of direction and range under full power without loss of momentum save considerable time during the tractor's daily operation.

POWER

Two engines with a total of 436 h.p. (413 net h.p. at drive train) make this Euclid "Twin" the world's most powerful crawler. Being more powerful, the TC-12 offers additional benefits, such as faster work and longer engine life, since the engine often operates at less than full capacity without strain. And, the reserve power permits handling the toughest tractor job.

MANEUVERABILITY

Pivot turns with the TC-12 take less space and time. Changing directions on the go with Torqmatic Drives makes maneuvering into position quicker. Split-half construction gives better traction on uneven ground.

EASY OPERATION

Clutching and shifting are eliminated with the TC-12 "Twin". There's 24-volt push-button starting and instant response to directional levers, range selector and hand throttle levers, all of which are conveniently located to allow complete freedom of the operator's right hand for control of attachments.

DESIGNED FOR EASY SERVICING

Many design features contribute to long life and easy servicing. Location of radiator behind operator reduces damage and improves cooling. Track tensioning and recoil system are automatic. All engine accessories are readily accessible from outside the engine compartment. Rollers can be removed without breaking track. Engines, Torqmatic Drives, and planetary final drives can be removed without disturbing the other components.

THEY ALL ADD UP to just one thing—
Euclids are your best investment.

EUCLID DIVISION,
GENERAL MOTORS CORPORATION, Cleveland, 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

New technical booklet contains .

LATEST INFORMATION ABOUT USS "T-1" STEEL

Send the coupon for your free copy!

It tells **Where** to use USS "T-1" Steel!
When to use it!
How to use it!

Get this newly revised compilation of technical and application data.

It will help you design and work with this remarkable constructional alloy steel.

REMEMBER

No other steel possesses "T-1's" remarkable combination of high yield strength, toughness and weldability. Send the coupon for design and fabrication data.

ALL-NEW TECHNICAL BOOKLET!

United States Steel
Room 5629, 525 William Penn Place
Pittsburgh 30, Pennsylvania

Please send a copy of your new booklet, USS "T-1."

NAME AND TITLE _____

_____

FIRM _____

ADDRESS _____

CITY _____ **STATE** _____

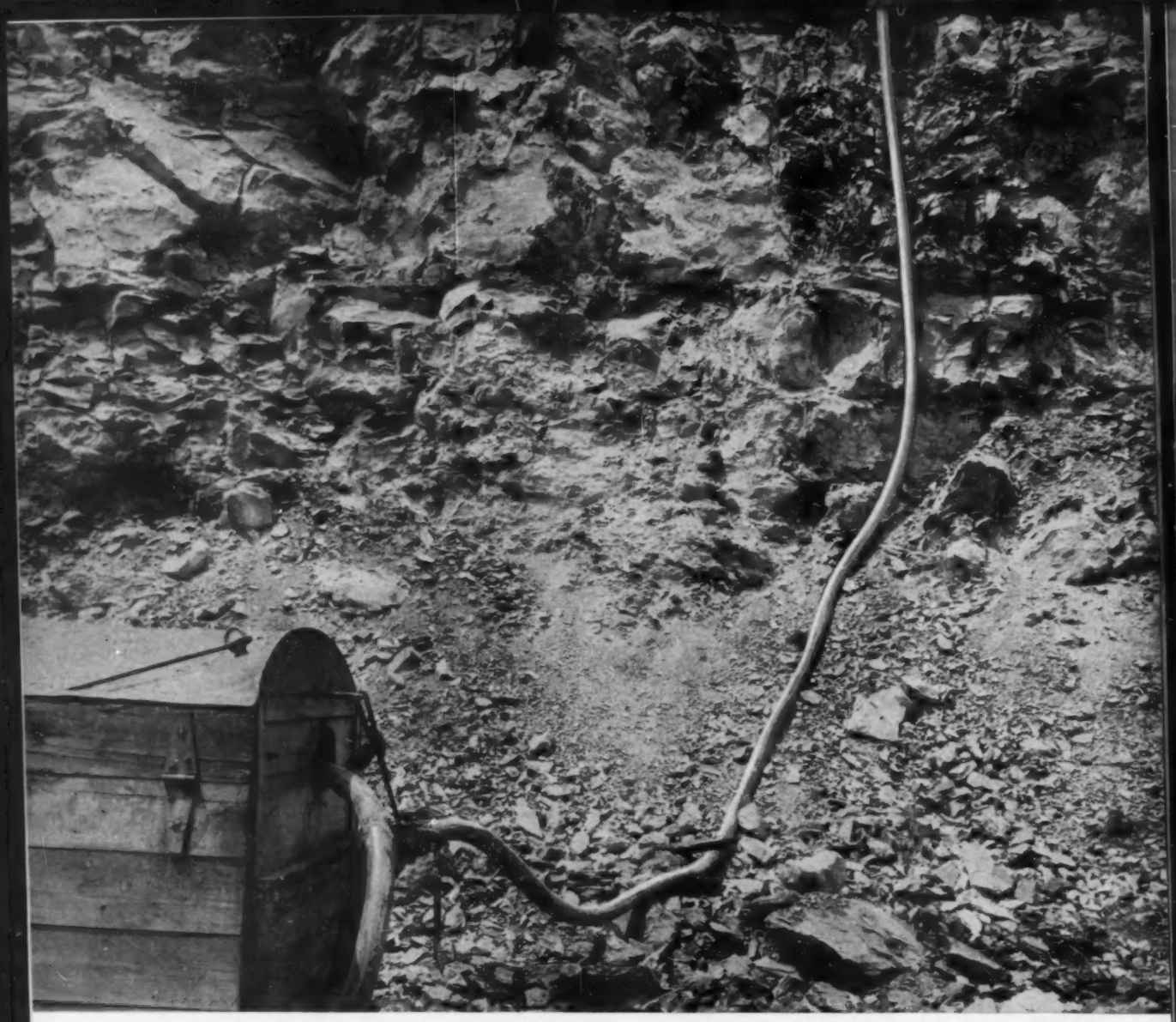
UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks.

Watch the **United States Steel Hour** on TV every other Wednesday (10 p.m. Eastern time).

UNITED STATES STEEL



60 ft. drop over rocky cliff—yet no power failure with Anaconda Mine Power Cable!

This cable is exposed to about as rugged a set of conditions as any cable is likely to meet. It has been pulled over sharp rocks . . . dropped over a 60 ft. cliff . . . and lies unprotected under sun and harsh weather day after day. Yet it has given unfailing service.

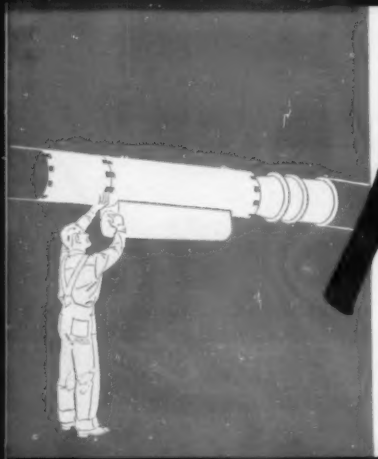
Why? Anaconda Mine Power Cable is designed and made by people who know *both* mining and cable engineering!

NEOPRENE JACKET is extra tough . . . has real flexibility and great strength. It resists abrasion, mechanical abuse, flame and water.

BUTYL INSULATION has superior long-aging characteristics . . . excellent resistance to ozone, heat and moisture. And it has high dielectric strength.

The Man from Anaconda or your Anaconda Distributor can give you full information about this durable, low-cost mine power cable. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 67222

SEE YOUR **ANACONDA®** DISTRIBUTOR
FOR **MINE POWER CABLE**

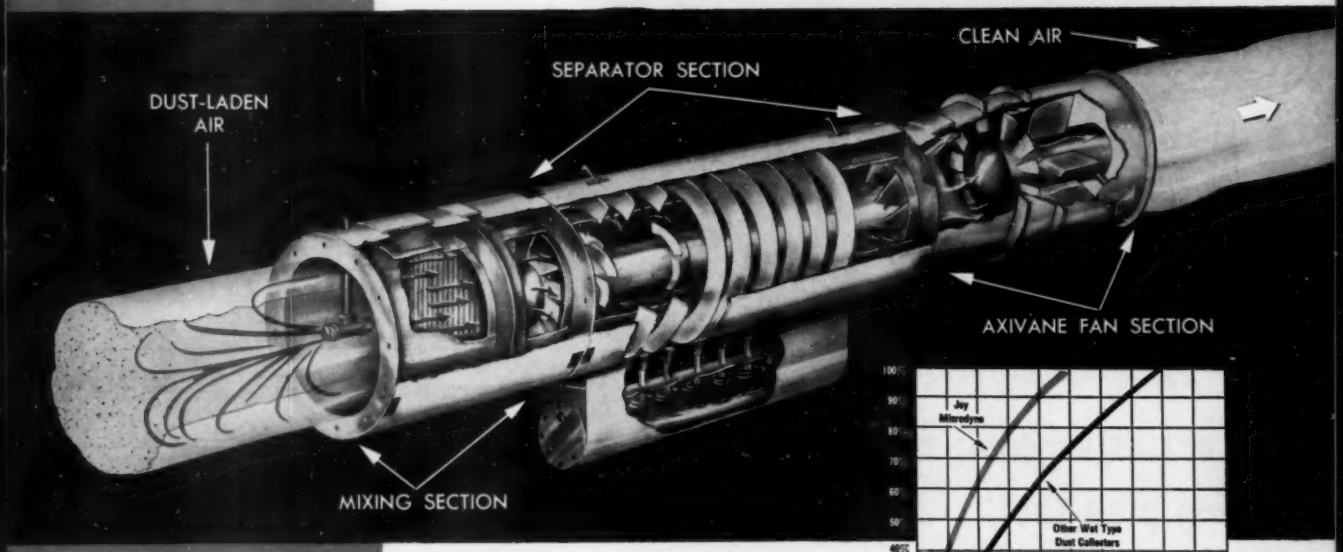


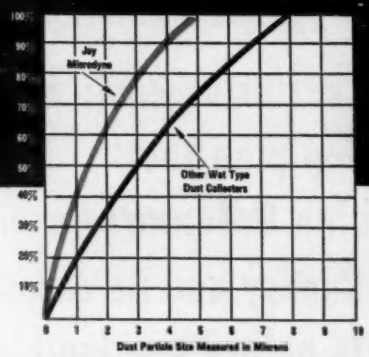
IT'S NEW!

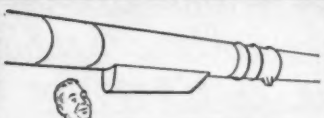
THE COMPACT, HIGH EFFICIENCY

JOY MICRODYNE

DUST COLLECTOR





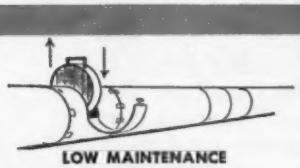


CAN BE INSTALLED WHERE NO OTHER DUST COLLECTOR COULD FIT

Fits into existing ductwork, often right at point of use.

CLEANS 2500 to 64000 CUBIC FEET EACH MINUTE

There is a Joy Microdyne model designed to meet the special conditions of the application.



LOW MAINTENANCE AND POWER COST

Self-cleaning impingement unit is easily removed. Power requirements are unusually low.

1/10 to 1/20

THE SIZE OF ANY OTHER DUST COLLECTOR

Here's a new, wet-type dust collector with an efficiency rating of over 99% down to 5 microns, yet so small and compact it fits where no other collector could. Your own maintenance crew can bolt it easily into existing ductwork, often right where dust originates. Air-borne dust particles, drawn into the mixer section by a Joy Axivane fan at the rear of the collector, are entrained by water after impact on an impingement element. Dust encased in water droplets passing to the second section are directed by centrifugal force to the wall of the cylinder, thence to a sump below, where the slurry can be pumped or drained away. Low power and water requirements result in unusually low operating cost. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** *In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

LOWEST COST PER CFM FOR THESE TYPICAL APPLICATIONS

- Metal scale in steel plants and foundries
- Air-borne sand in foundries
- Cleaning air contaminated in mining operations
- Coal dust at screening and drop-off points
- Wherever crushing or grinding operations occur
- Recovery in Uranium mining
- Explosive dust in grain elevators or flour mills
- Dust from granite quarrying and finishing
- Removal of sulfuric acid mist
- Removal of abrasive dusts like taconite

Write for FREE Bulletin JB-616 or FREE Dust Test

Get this descriptive bulletin or let a Joy Engineer take dust samples at your job site for plant analysis.

ADDRESS DEPT. 134-8

JOY MANUFACTURING COMPANY

EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY

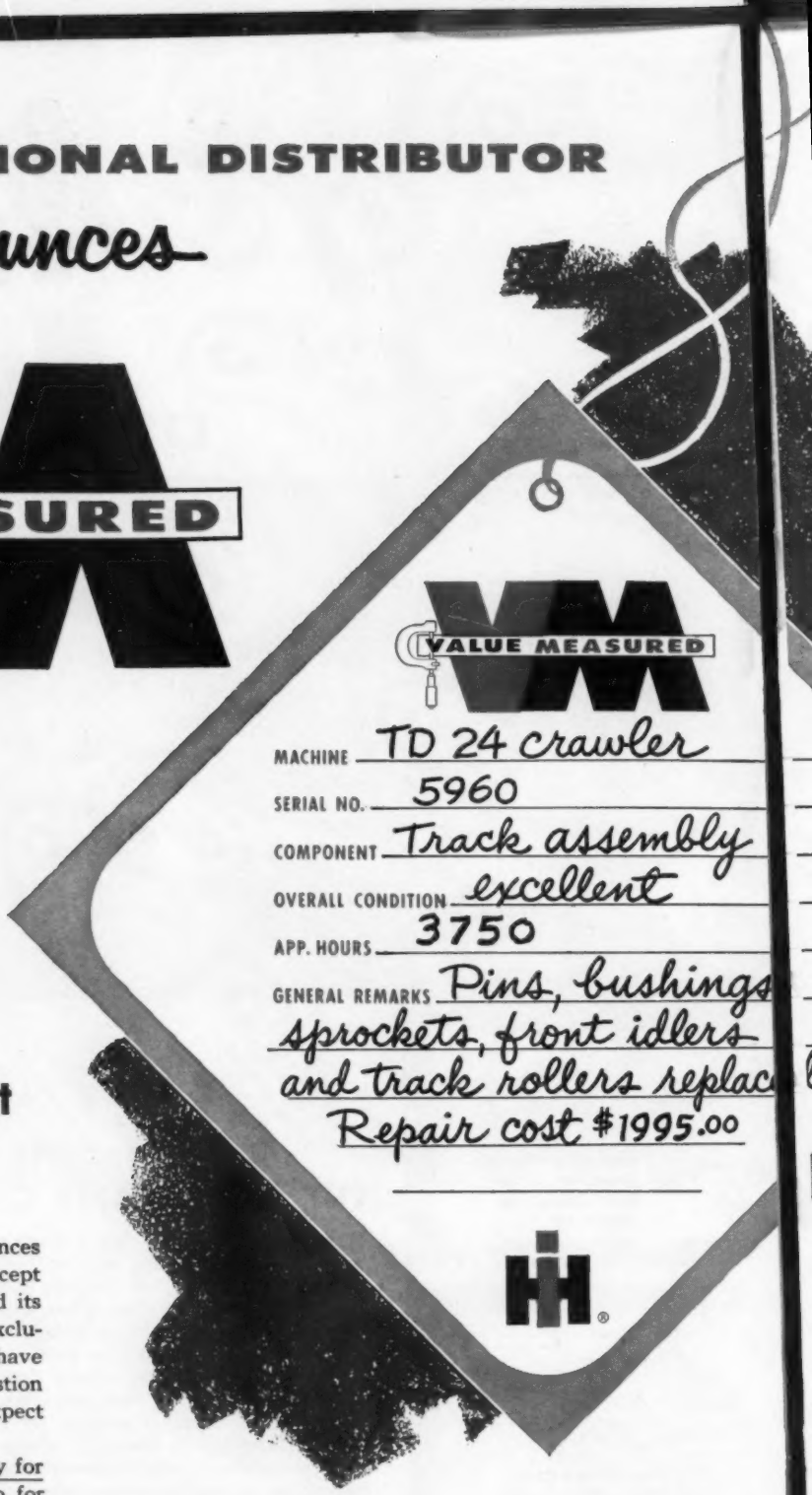
WSW 1-6710-184

YOUR INTERNATIONAL DISTRIBUTOR

proudly announces

VM

VALUE MEASURED



The exclusive equipment buying plan that Value Measures used machinery and its component parts before you buy!

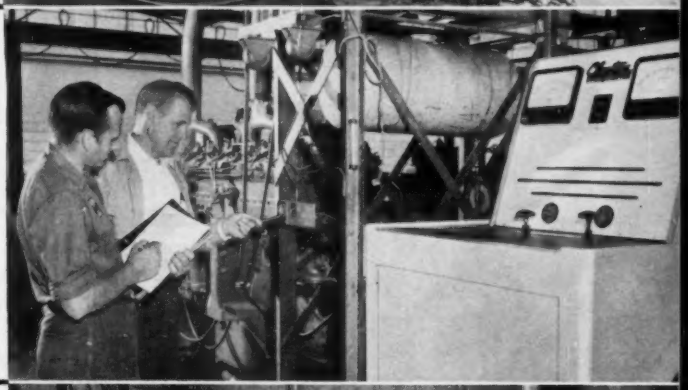
Your International Distributor proudly announces VM... a revolutionary equipment buying concept that measures the value of used machinery and its components before you buy! Now, under this exclusive International Distributor program, you can have a reasonable answer to your most important question when buying used equipment..."What can I expect of this machine and for how long?"

The answer is supplied in two ways, not only for the over-all condition of the machine but also for all the major parts of the machine as well! And the answers are easy to get. They're all tabulated for you on big tags, (see illustration, above), which are attached to the component or near it. Each tag names the component, gives you the over-all condition of it, tells the approximate hours of operation (because parts are changed in units at different times), and shows whether the item has been repaired or replaced with a new part. The tags permit you to examine a piece of used machinery quickly, completely, and with confidence. In fact, VM—the IH Value-Measured Used Equipment Plan—does for you what you yourself would like to do to check used equipment, if you had the time and facilities.

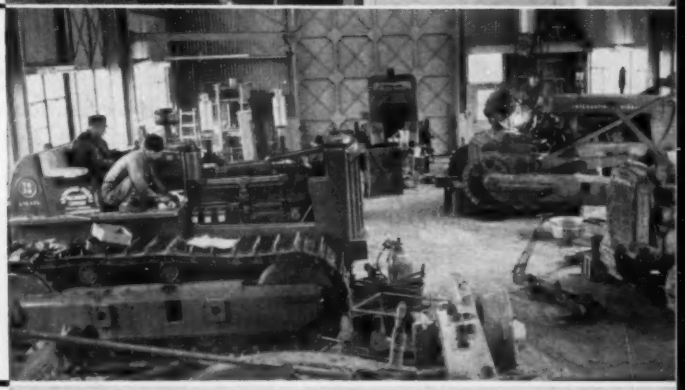
Your International Construction Equipment Distributor has Value-Measured Used Equipment buys on his lot, now. Be sure to see him soon and find out why VM is your best way to buy used construction machinery.

Clean-up! A Value-Measured Used Equipment buy first gets a steam bath before inspection of major parts. Clean machine reveals wear, cracks, other damages which need repair.

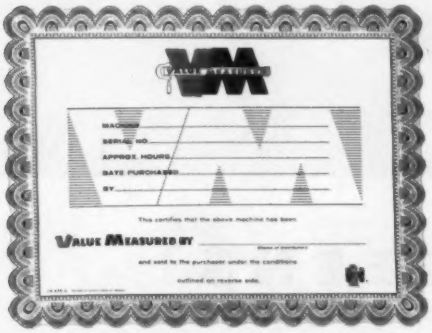
Check up! Dynamometer engine testing is typical of thorough inspection and testing before and after worn engine parts are replaced. Testing equipment of this type enables distributor to guarantee performance on VM equipment.



Fix up! After testing, distributor servicemen make necessary repairs and adjustments to equipment. All such repairs and their cost are tabulated on VM tags which you'll find conveniently attached to the components.



Measure up! You'll find the VM buy headquarters sign only at your International Construction Equipment Distributor. Stop here soon if you need used construction equipment...and become acquainted with the industry's newest, safest, and most economical way to buy used machinery...the VM way.



VM Purchase Certificate is your guarantee that every major working area of the used machine has been thoroughly checked and repaired, or replaced, when necessary. It also means your VM used machine is the best buy for the price.

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

for road screening operations it's . . .

CF&I INDUSTRIAL SCREENS

For accurate screening . . . maximum resistance to abrasion, vibration, and fatigue . . . long screen life and the assurance of large tonnage output at low cost . . . you can depend upon CF&I Industrial Screens. That's because CF&I Screens are made from specially selected steel, then crimped and woven extra tightly to assure maximum usage throughout screen life—even when subjected to severe corrosion, abrasion, or high temperatures.

Next time you need industrial screens, take a tip from the builders of the Nation's highways and choose CF&I Industrial Screens. You'll find it a profitable choice.

4483

SPACE SCREENS

THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Casper • Denver • El Paso Ft. Worth • Houston • Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Antonio San Francisco • Seattle • Spokane • Wichita

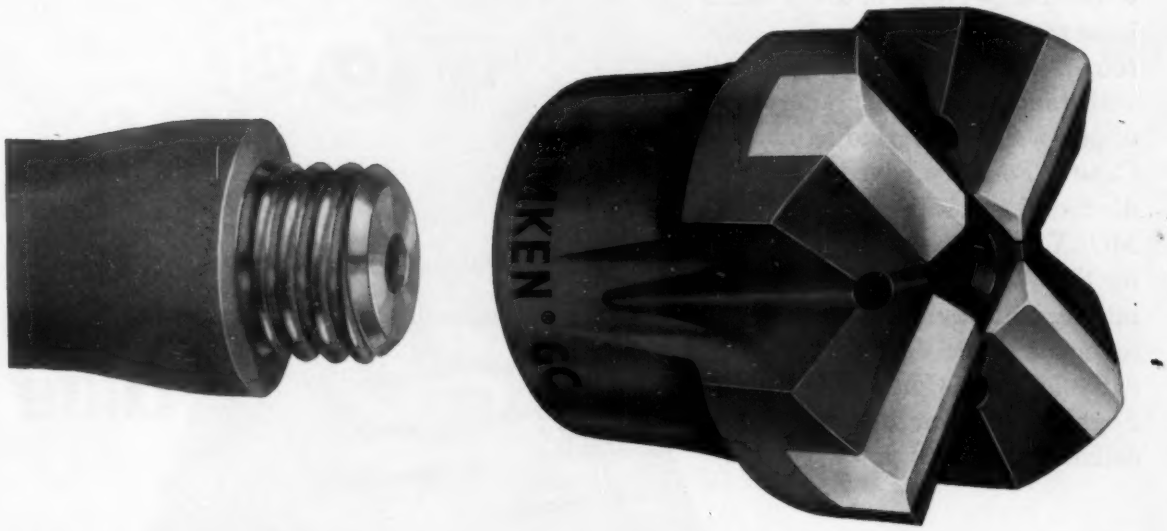
WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

CF&I OFFICES IN CANADA: Toronto • Montreal **CANADIAN REPRESENTATIVES AT:** Calgary • Edmonton • Vancouver • Winnipeg

For drifters, sinkers, stopers and jumbos...

New TIMKEN® threaded carbide bit

clears chips faster.. lasts longer.. cuts cost



New frontal design shoots jets of water against the face from five specially positioned front holes, washes chips back faster. You get better cutting action with less drag, because center hole is larger, recess deeper. *Cuts your cost per foot-of-hole.*

New wing design... deeper, wider clearance between the wings works with five front holes. Water carries chips away faster from the cutting face, speeds drilling, boosts cutting efficiency. *You get lower cost per foot-of-hole.*

Deeper relief under the heel provides extra clearance for washed-back chips, cuts bit drag, adds to bit life. The deeper relief and redesigned heavier wing help drilling go faster, *lower your cost per foot-of-hole.*

New wear-resistant carbides increase bit life. Special analysis carbides provide better wear-resistance, added shock-resistance. Bit can be reconditioned many times. Another feature that gives you *lower cost per foot-of-hole.*

Improved thread contact reduces breakage, gives you longer bit life, *lowers your cost per foot-of-hole.* Send today for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

THERE'S A TIMKEN BIT FOR EVERY JOB . . . EVERY DRILLING CONDITION

TIMKEN MULTI-USE BIT

With correct, controlled reconditioning, gives lowest cost per foot-of-hole when full increments of steel are used.

NEW TIMKEN TAPERED SOCKET BIT

For air-leg drills and light stoping. Removable, for full steel life. Tapered for more secure union. Same new frontal features as threaded bit.

TIMKEN TRADE-MARK REG. U. S. PAT. OFF. ***REMOVABLE ROCK BITS***

For those hard, tough jobs . . . try

CHROME MOLY or MANGANESE STEEL CASTINGS

• Discharge grates in ore grinders have to be made of a metal that's tough, hard and strong. That's to withstand the abrasion and corrosion of ore, water and grinding media. Capitol Foundry Division casts discharge grates from CHROME MOLY or MANGANESE STEEL for the West's fast-expanding mining industry. Chrome moly or manganese steel castings can help cut *your* costs. Consider Capitol Foundry Division for service, delivery and quality. AA-6944

THEY'VE GOT TO BE TOUGH!

CAPITOL FOUNDRY DIVISION

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Post Office Box 750, Phoenix, Arizona

GENERAL OFFICES - CLEVELAND 6, OHIO

Established 1868

Manganese Steel Castings • Carbon Steel Castings • Alloy Steel Castings
Ni-Hard Castings • Gray Iron Castings • White Iron Castings

BUILT TO TAKE A BEATING

ESCO RUBBER CUSHION-MOUNTED HINGES

ELIMINATE RIVET AND WELDING FAILURES ON DIPPER DOORS

The continuous pounding of extra-mean rock jobs is no problem for *ESCO* Dippers equipped with rubber cushion doors.

This new patented *ESCO* Rubber Cushion Mounted Wedge-Type Door can stand the high impact and shock of rough digging jobs. Wedge-type mounting eliminates troublesome rivets and objectionable excessive door weight. The hinges are cushioned along their entire length in oil-resistant rubber to absorb the shock that often causes hinge failure or other damage to ordinary welded or riveted dipper doors. Wedges replace rivets — locking the hinge to the door — providing full length cushioned hinge bearing. The Rubber Cushion Mounted Wedge-Type Door is available as standard equipment on a wide range of *ESCO* Dippers.

ESCO Dippers are built to out-dig any dipper made and to surpass all others—feature for feature.

See your ESCO dealer. Ask for Catalog No. 189.

ESCO®

ELECTRIC STEEL FOUNDRY COMPANY

2147 N. W. 25TH AVE. • PORTLAND 10, OREGON

MFG. PLANTS AT PORTLAND, ORE. AND DANVILLE, ILL.

Offices in Most Principal Cities

ESCO INTERNATIONAL, NEW YORK, N. Y.

IN CANADA ESCO LIMITED

the BIG 3 puts the 2½-yd. LORAIN-85A years ahead!

These 3 big features will mean more to you in profits than anything you can find in any other 2½-yd. shovel-crane. They mean greater operating ease, longer life, increased crane capacities and reduced maintenance. Of course, there are many more features in the Lorain-85A . . . torque converter power-take-off, new "operator designed" cab, full air controls of all crawler operations, removable counterweight, are but a few. The Lorain-85A is years ahead in the important features that will put you 'way ahead in profits.

Be sure you know all about the "85A" . . . your Thew-Lorain Distributor will explain every detail!

Big 2½-yd. Lorain-85A Shovel takes tough digging in stride, as it "blasts" its way through this solid rock. Note the operator at the 2-lever, "Joy-Stick" air controls . . . the simplest, easiest, most effortless operator controls on any machine. Production gets a boost—and the operator gets a break with the new Lorain-85A.

THEW LORAIN

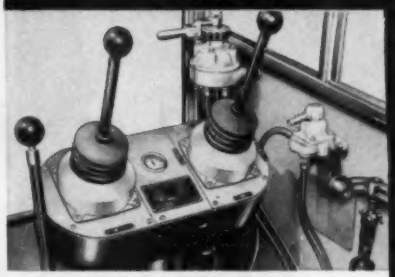
1.

"SHEAR-BALL"* TURNTABLE MOUNTING

Turntable is secured to crawler and revolves easily and freely on a huge "ball bearing." No center pin or nut, centering gudgeon or exposed roller path . . . no turntable rollers . . . no constant adjustment, maintenance or lubrication problems.

2.

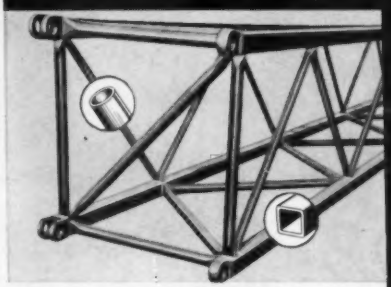
2-LEVER, "JOY-STICK" AIR CONTROL



The newest of all shovel-crane power controls. "Metered Air" feeds power to clutches at any rate desired — yet operator retains full "feel" of all operations. Fewer levers, fewer motions, faster, smoother, less effort, less fatigue.

3.

SQUARE-TUBULAR-CHORD* BOOM

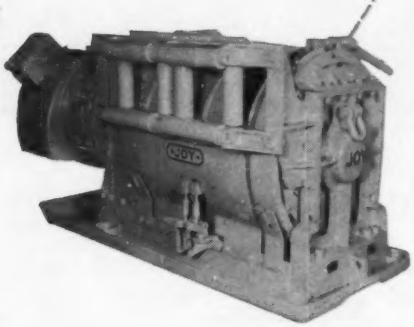


Reduces boom weight and increases lifting capacities. 40 to 48-ton crane capacities on general-purpose crawler . . . 50 to 60-ton on larger, wider crawler . . . up to 200 ft. boom, plus 40 ft. extension available.

THE THEW SHOVEL CO., Lorain, Ohio

**U.S. and foreign patents applied for.*

MEDIUM IN SIZE . . . LARGE IN CAPACITY
A NEW CONTINUOUS-RATED SLUSHER FROM JOY



The C2F-211A is a *new* kind of slusher. It is the size of a medium capacity machine . . . compact and portable enough to move from place to place in the mine. Yet, it approaches large capacity slushers in load lugging ability and hour-after-hour stamina.

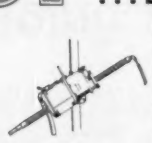
To meet extra-heavy digging requirements this newest Joy slusher is powered by a 50, 60, or 75 HP high-torque, high slip, flange-mounted motor. The high torque developed pulls the scraper through the pile without stalling. By eliminating repeated stalling and starting, fewer shock loads are imposed on the machine. Other features, such as *three* idler gears in each drum's planetary system provide 50% greater capacity.

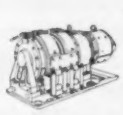
Depending on motor horsepower and rope pull desired, rope speeds range from 165 to 350 feet per minute. Find out more about the C2F-211A, the new medium-sized slusher that hauls the bigger scraper loads. Write **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WRITE FOR FREE BULLETIN 183-8

WSW M 6703-183

JOY . . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY


Core Drills


Slushers

Rock Bits

Trackless Equipment

Aurelio Rivera, foreman, and Harry R. Marugame, superintendent, Kailua Limestone Co., Kailua, Oahu, T. H.

"Union Oil Products and Service...*the finest*"

"Our new D9 'Cat,' like all our equipment here is protected with Union lubricants.

"For the past seven years we've used Union's Guardol and T5X Motor Oils as well as Unoba multi-purpose grease throughout our operation. These lubricants have done an excellent job protecting our trucks, tractors, loaders and stationary units from the effects of abrasive rock dust and the heavy precipitation common to this side of Oahu. Our 'down time' and maintenance costs remain extremely low.

"Service, too, is an important factor as far as we're concerned. And we can truthfully state that our Union Oil representative at Kailua has always provided *the finest.*"

For prompt delivery of *the finest* industrial lubricants and fuels, do as thousands of other successful equipment operators do—call your nearby Union Oil representative.

UNION OIL COMPANY 76
OF CALIFORNIA

Los Angeles: *Union Oil Bldg.* • **New York:** *45 Rockefeller Plaza* • **Chicago:** *1605 Bankers Bldg.* • **New Orleans:** *644 National Bank of Commerce Bldg.* **Dallas:** *313 Fidelity Union Life Bldg.* • **Atlanta:** *1401 Peachtree St.* **Kansas City, Mo.:** *612 West 47th St.* • **Boston:** *214 Harvard Ave.* **Philadelphia:** *No. One Wynnewood Rd., Wynnewood, Pa.*

How self-powered scrapers help cut mine operating costs

Tournapulls may be self-loaded, push-loaded, or shovel-loaded. The 9-yard "D" shown here hauls at speeds to 29.5 mph, unloads in seconds, makes complete turn in 26 feet. Simple electric controls and big 4-wheel air brakes permit rig to work safely at high speeds in tightly restricted quarters.

Read the following list of mine-scraper applications . . . analyze these scraper economies for your open pits:

1 In auxiliary stripping, where overburden is so thick that the wash or earth must be removed to allow boom-type equipment to work within its economical limits.

2 Where spoil room for boom-tool operations is inadequate; where outcrop is bothered by property lines, highways, railroads, pipe lines, power lines and undivertable streams.

Rigs make 180° turns, in less than machine's length, operate in tight quarters as shown above. Tournapulls keep working in tough going when other self-powered scrapers bog down. When one wheel slips, exclusive power-transfer differential automatically transfers power to wheel on firmest footing. Positive geared steer on kingpin pivots prime-mover from side to side, "walking" drive wheels to fresh footing.

3 Widening a bench at the side of the pit to provide greater casting area for shovel or dragline.

4 Stripping wet top-layers of earth, which might slough and cause slides into a shovel cut.

5 Cutting the initial box-cut, depositing the spoil out-of-the-way of later dragline operations.

6 Stripping or mining small or isolated veins that do not warrant the expense of moving large excavating equipment to the site.

7 Stripping hillside and hilltop operations...self-powered scrapers particularly adapted for this type of work.

8 Cutting new beds for temporary or permanent stream diversions; building dams and settling ponds.

9 Building grades for railroads and for truck haul-roads.

10 Construction and maintenance of ditch and drainage systems.

11 Grading around mine buildings and mine location housing.

12 Land-fill disposal of refuse.

13 Stockpiling of coal . . . spreads in even layers, compacts while hauling.

14 Supplementary hauling of ore, coal, or overburden...open-top scraper can be shovel-loaded and used as a truck-type hauler.

15 Mining lean ore, previously abandoned, in widely scattered or isolated areas.

16 Stripping overburden where level piling of spoil is required.

17 Stripping shallow overburden which does not justify expense of installing and operating major excavating equipment.

18 Leveling spoil piles for drainage, reforestation, farming, etc.

19 Removing and replacing top-soil for reclamation purposes.

If you have any of the above dirt-moving problems . . . write us or check with your nearest LeTourneau-Westinghouse Distributor. We will be glad to have our experienced field engineers analyze your operation and propose suitable procedure and equipment for most economical handling. Our rubber-tired prime-mover scraper combinations are available in three sizes: "D", 138 hp, 9 yards heaped capacity; "C", 210 hp, 18 yards heaped capacity; BIG "B", 293 hp, 27 yards heaped.

Tournapull—Trademark Reg. U.S. Pat. Off. P-1508-M-Ir

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

The combination of roof bolts, square plates, and wire mesh improves the safety in this metal mine.

Anchor Your Roof with Bolts

More and more Western mines are safer, with less danger of severe roof falls, because they've installed Bethlehem Pacific roof bolts.

Using bolts has other advantages besides safety—

1. They make possible wider openings and clearances.
2. There's more room for mechanized equipment at the face.
3. Better ventilation, due to absence of bulky supports.
4. Fire hazards are reduced.
5. Haulage is speeded up.

TWO TYPES OF ROOF BOLTS

Bethlehem Pacific makes two types of roof bolts: the slotted bolt with a forged slot and flame-cut wedge and the square-head bolt with expansion shell. The choice depends on your local rock conditions.

ROOF BOLT ACCESSORIES

We supply a full range of roof bolt accessories: hardened washers, roof plates—both square and triangular, flat or dished.

The nearest Bethlehem Pacific sales offices will gladly arrange for an engineer to give you full details. A phone call or a letter is all that's necessary.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales offices: Phoenix, Los Angeles, San Francisco, Spokane, Seattle, Portland

BETHLEHEM PACIFIC

BETHLEHEM STEEL

HAULS 4,000 TONS OF ROCK DAILY

Tournapull operator backs Rear-Dump up to edge of crusher, and flips electric hoist-switch. As body raises, rocks are dumped fast and safe. Body swings below and behind rear wheels, so rocks cannot obstruct wheels.

An abundant supply of base material was vital to Broce Construction Co., Dodge City, Kansas, when they began putting an 18″ base on a 10-mile section of highway. Nelson Bros. Quarries, La Harpe, contracted to supply Broce with more than 400,000 tons of stone and sand for necessary base material. In order to maintain the continuously high rate of aggregate production needed, Nelson Bros. relied on their 3 high-speed, 22-ton LeTourneau-Westinghouse C Tournapull Rear-Dumps. These fast-stepping haulers high-balled material from pit to crushing plant at a fast pace, hauled 4,000 tons of blast-rock daily per machine.

Note big 22-ton rock load in heavy, welded-steel Tournapull Rear-Dump body. On this rugged pit job machines successfully withstood much of this hard pounding.

Average 22 tons of rock per load

At Nelson Bros.' quarry, 3 mi. northwest of Reading, C Rear-Dumps worked with 2½-yd. shovel. Their short 90° turn radius enabled operator to maneuver machines easily, and spot fast under dipper. Each L-W Rear-Dump was loaded with 22 tons of blast-rock in 1¼ min. Rear-Dump's wide 8'9″ bowl, with low rear-entry, provided large, easy target area for shovel operator . . . reduced spillage and clean-up. Since shovel operator did not have to "lift" dipper high to get in and out of bowl, he saved valuable time on bucket's swing-cycle. This, plus time saved in hauling, maneuvering, and dumping, enabled Rear-Dump to make more round-trips . . . haul more tonnage per working-day.

Big brakes add safety on downhill hauls

'Pulls' multiple disc air brakes on all 4 wheels provided 3,762 sq. in. of braking surface for safe hauling on down-grades. At crusher, operator swung in fast . . . set rear-wheel brakes . . . and touched electric switch on control panel to activate hoist-motor and raise body. As bowl tilted, it swung discharge lip below and behind rear wheels . . . kept rocks from slipping underneath wheels as Rear-Dump fed load directly into crusher.

"These machines beat anything"

Supt. Carl A. Nelson reports his Tournapull haulers work profitably and efficiently. He said, "We have had excellent service from our Rear-Dumps. They haul from quarry pit to crusher, and have to take abuse on that type of work — but they are plenty rugged to take it." Nelson added, "They have plenty of power . . . can say we've had trouble-free service. We've worked all winter, in all kinds of weather. We can always depend on quick, easy starting on coldest days. These machines beat anything I've seen."

Heavy-duty haulers for tough jobs

For rugged, heavy-duty haulers to handle those tough jobs at your quarry, investigate the advantages of Tournapull Rear-Dumps. They take rough treatment, give you continuous high production. Write us for complete details.

Tournapull—Trademark Reg. U.S. Pat. Off. CR-1195-Q-bw

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

the big league ball player has his equipment custom-made because he gets something **EXTRA**

the profit-wise operator

BUYS TRAYLOR REDUCTION CRUSHERS for the same reason

Traylor Reduction Crushers are famous throughout the industry for the extra *production* and extra *profits* they put into mining operations. Traylor-made in ten sizes, with feed openings from 1½" to 22", Traylor Reduction Crushers provide capacities up to 590 tons per hour. For complete specifications write for Traylor Bulletin No. 11-120.

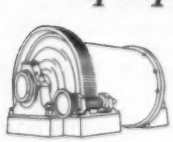
TRAYLOR ENGINEERING & MFG. CO.
972 MILL ST., ALLENTOWN, PA.
Sales Offices: New York—Chicago—San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P.Q.

the experts agree . . . there's nothing like

TRAYLOR-MADE

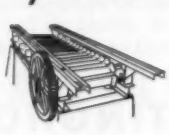
equipment for peak performance

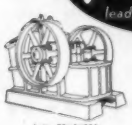
A Traylor leads to greater profits


BALL MILLS

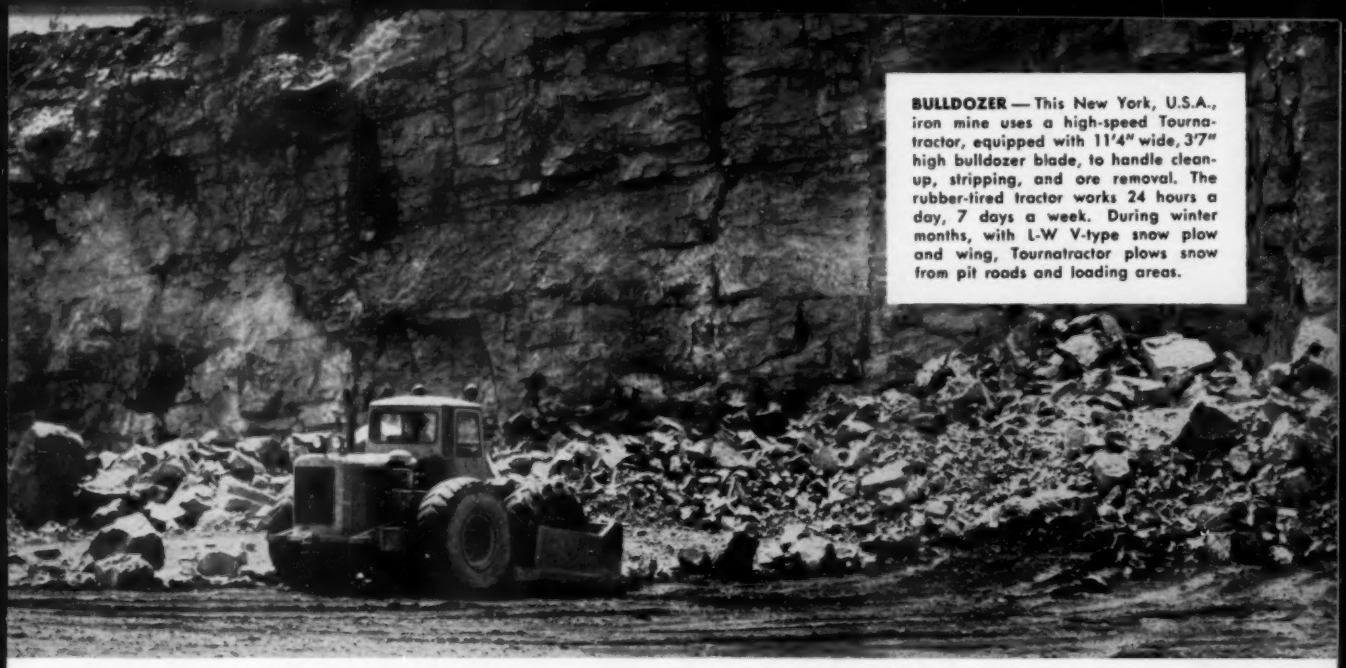
ROTARY KILNS

PRIMARY GYRATORY CRUSHERS


APRON FEEDERS


JAW CRUSHERS

SECONDARY GYRATORY CRUSHERS



BULLDOZER — This New York, U.S.A., iron mine uses a high-speed Tournatractor, equipped with 11'4" wide, 3'7" high bulldozer blade, to handle clean-up, stripping, and ore removal. The rubber-tired tractor works 24 hours a day, 7 days a week. During winter months, with L-W V-type snow plow and wing, Tournatractor plows snow from pit roads and loading areas.

Are you using 2 tractors where 1 would do?

SCRAPERS—At a southeastern U.S.A. open-pit phosphate mine, owners use 2 Tournatractor-drawn scraper teams for constructing levees around waste ponds. Optional LeTourneau-Westinghouse double-drum PCU efficiently operates any cable operated equipment.

TOWS EQUIPMENT — At a large silica mine, Tournatractor cuts downtime for air-compressors and other heavy equipment by moving them from one location to another fast. Tractor's big, low-pressure tires cross RR tracks, air-drill hoses, pavement, without damage.

ANGLEDOZER — Leading copper mine uses Tournatractor, equipped with Angledozer blade, for clean-up of railroad tracks and loading area around widely-scattered shovels. Angledozer blade carries 3 cu. yds. per pass. Blade can be angled 20° right or left.

SWITCHTRACTOR—A uranium mine's Tournatractor, equipped with type "E" railroad coupler, spots ore cars in between dozing chores. Versatile rubber-tired tractor can move 5 loaded or 18 empty cars up a 1 per cent grade, is not tied to tracks as ordinary switch engines are.

This versatile rubber-tired LeTourneau-Westinghouse Tournatractor can handle your scattered pit clean-up and road-maintenance jobs twice as fast as slower-moving crawlers. Here's why:

"Go-anywhere" mobility

High-speed Tournatractor *drives everywhere under its own power* — is never more than a few minutes away from its next assignment in your pit area. Rubber-tired tractor travels across pit floor, over railroad tracks, air-drill hoses, pavement, without damage.

Handles wide variety of jobs

With a L-W attachment to fit almost any work assignment, Tournatractor keeps busy productively all year-around. Use it for spotting rail cars . . . for fast push-loading or towing service . . . for heavy dozing to improve or construct haul-roads, detours or drainage. You'll find a single Tournatractor handles more work over a wider area, without excessive tractor moving expense, than 2 or more crawler-tractors! Why use 2 where 1 would do?

Ask for more information

Tournatractor can lower costs and increase production at your pit, too. We will send you more owner-verified production reports on request.

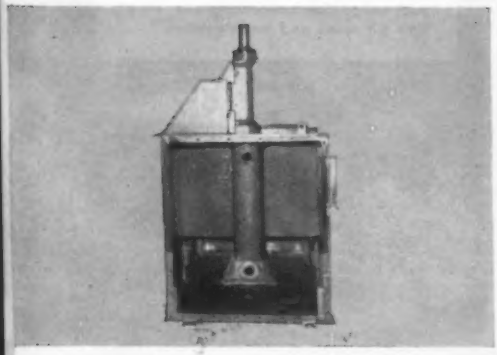
SwitchTractor—Trademark; Angledozer, Tournatractor—Trademark Reg. U.S. Pat. Off. CT-1495-M-1r

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

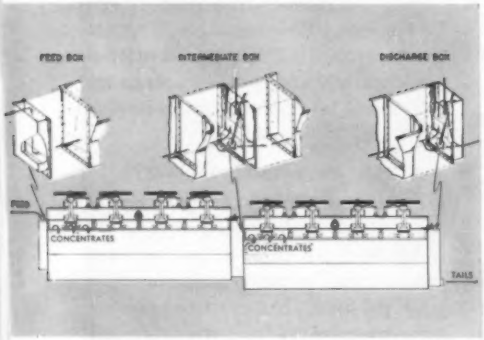
A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

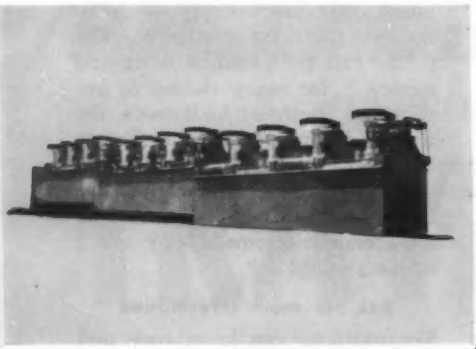
SIMPLE . . .
Low Cost
High-Tonnage Flotation Circuits



SIMPLE MECHANISM—gives high efficiency at low speeds, low horsepower. Parts have exceptionally long life. Simple to operate, simple to inspect, simplified part replacement.



SIMPLE TANK DESIGN—simple, unobstructed pulp flow makes possible high tonnage circuits at low cost. Simple, strong and rugged, yet low in cost.



SIMPLE CIRCUITS for high tonnage—rough, scavenge, and clean in one machine. Complete interchangeability of parts and mechanisms simplifies mill construction, operation, and maintenance.

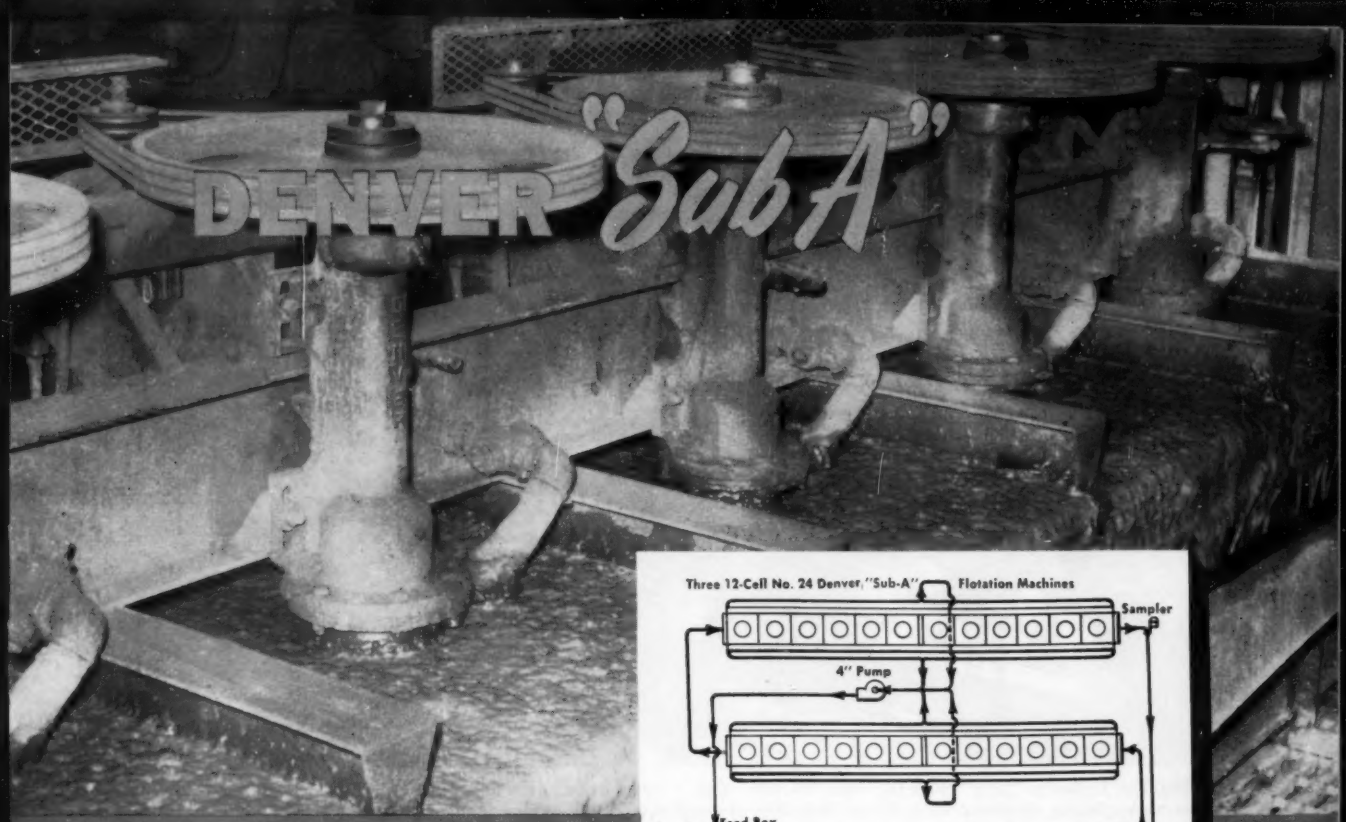
Denver Can Supply Complete Mill Equipment For Your Mill

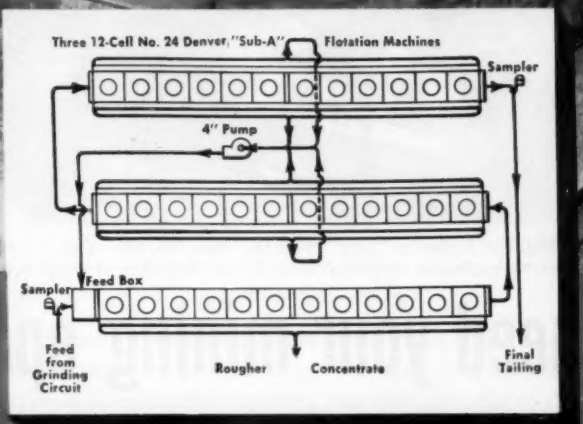
One Responsibility

World-wide Leaders in BIG Tonnage, SIMPLE Flotation Circuits

PLANT LOCATION	TOTAL NO. OF CELLS	TOTAL FLOTATION TONNAGE PER 24 HRS.	TYPE OF ORE
ARKANSAS	105 No. 24	1200	Barite
AUSTRALIA	24 No. 30 20 No. 21	1720	Lead-Zinc
BEL. CONGO	336 No. 24	5500	Copper
BR. COLUMBIA	10 No. 24	1100	Zinc
BR. COLUMBIA	22 No. 30	5000	Copper
BR. COLUMBIA	28 No. 30	3500	Tin
CHILE	48 No. 21 12 No. 30	2900	Cu-MoS_2 Separation
COLORADO	36 No. 24	2400	MoS_2
FLORIDA	4 No. 30	2100	Phosphate
FLORIDA	32 No. 30	8160	Phosphate
IDAHO	42 No. 24	1100	Silver
IRELAND	58 No. 24 80 No. 30	4000	Copper
JAPAN	255 No. 21	1320	Copper
MANITOBA	24 No. 30	2850	Zinc
MANITOBA	24 No. 30 112 No. 24	2400	Cu-Ni
MICHIGAN	73 No. 24	6000	Copper
MICHIGAN	26 No. 24	1850	Hematite
MONTANA	12 No. 30	850	Zinc
NEW JERSEY	12 No. 24	1200	Silica Sand
NICARAGUA	24 No. 24	2000	Gold
NO. RHODESIA	120 No. 30	5000	Sulphide & Oxide Cu
ONTARIO	88 No. 24	1800	Cu-Ni
ONTARIO	552 No. 30	40,000	Cu-Ni
ONTARIO	8 No. 30	1600	Cu-Ni
PENNSYLVANIA	24 No. 30	2500	Coal
PENNSYLVANIA	8 No. 30	2100	Coal
PENNSYLVANIA	48 No. 30	5670	Coal
PHILIPPINES	24 No. 30 44 No. 24	4000	Copper
QUEBEC	46 No. 24	1000	Copper
QUEBEC	8 No. 30	900	Zinc
TENNESSEE	14 No. 24	840	Zinc
TENNESSEE	48 No. 24	4000	Copper (Roughers)

Mill tonnage through an individual circuit depends upon contact time, density, and treatment required. Generally, pulp flows for open or free flow Denver "Sub-A" machines will range up to 750 GPM through a No. 24 (50 cu. ft. cell) and up to 1500 GPM through a No. 30 (100 cu. ft. cell).





2400 tons per day, —20 mesh pulp at 50% solids are treated in this DENVER "Sub-A" Rougher Flotation circuit. Recovery and grade are highly acceptable. Operation is simple, trouble-free. Part life is in excess of 2,000,000 tons.

2400
Tons per day
IN SINGLE CIRCUIT

RECENT CASE HISTORY: Two identical, parallel 2400 ton per day rougher flotation circuits were compared. Initial cost, installation and operation were comparable. DENVER "Sub-A" Flotation (Machine A) produced economic metallurgy. Part life is in excess of 2,000,000 tons.

Machine "B" did not meet recovery or grade requirements. Parts lasted only about 150,000 tons and Machine "B" was removed.

—Don't overlook the unseen factors in flotation that affect your profits.

"The firm that makes its friends happier, healthier and wealthier"

DECO ENGINEER — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado
DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO
MEXICO, D. F. • LONDON • JOHANNESBURG

Prospecting. The Universal 'Jeep'* with the extra traction of its 4-wheel drive, takes men and equipment anywhere on the lease for prospecting, exploring or survey work. It climbs grades as steep as 60%, goes where other vehicles can't go.

Speed your mining operations with 'Jeep' versatility and all-wheel traction!

The completely new Forward Control 'Jeep' FC-150 Truck. It's the first time a 4-wheel drive truck has so effectively combined so much cargo capacity (74-inch pickup box), with such exceptional "go-anywhere" maneuverability (81-inch wheelbase).

Mobile power. The versatile 'Jeep' gets to the job with sure dependability, and with power take-off supplies its own power to operate a portable drill, above. It also operates winches, welders, compressors, generators and many other types of equipment.

Rugged 'Jeep' vehicles are always on-the-job, in virtually every phase of mining. From initial surveys to transportation of men and equipment in the field, they help keep operations on schedule every day of the year.

No other vehicles match the 'Jeep' family for all-around mobility, range of performance and go-anywhere ability. On the highway they travel at top legal speeds in conventional 2-wheel drive. But, when the going gets tough, the extra traction of their 4-wheel drive hauls trailers in trackless mining, or carries personnel with parts and supplies over rugged terrain, through mud, snow or soft earth — in good weather or bad — to help keep maintenance and service work moving smoothly. These vehicles go where others stop cold in the heavy, rough going of mining projects.

'Jeep' vehicles supplement heavy-duty equipment, spread their costs over a wide variety of jobs, give you additional savings through long life and low maintenance costs. Ask your Willys dealer for a practical, on-the-job demonstration.

The 'Jeep'®

family of 4-Wheel-Drive Vehicles

WILLYS... makers of the world's most useful vehicles

**Model CJ-5 shown*

WILLYS MOTORS, INC., TOLEDO 1, OHIO

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

For Silica Flotation or Slime Flocculation-- AEROMINE® 2026 Promoter

Originally developed and manufactured for Cyanamid's own Florida phosphate operations, AEROMINE 2026 Promoter is an economical silica or silicate flotation collector and is also valuable as a flocculant for fine clay slimes to improve settling and filtration rates.

At Cyanamid's phosphate operations, rougher concentrates floated with crude tall oil contain considerable silica. These concentrates are washed with dilute sulfuric acid to remove the fatty acid coating prior to the silica float. In the cleaner circuit, 0.2 pounds per ton of AEROMINE 2026 with 2.0 pounds per ton of kerosene are used to float off the silica.

As a flocculant at a non-metallic operation producing clay minerals, 0.3 to 0.5 pounds of AEROMINE 2026 per ton of dry solids improve the filtration rate of slimes as much as 35%.

Here are the properties of AEROMINE 2026 Promoter:

Color	– Dark brown
Consistency	– Viscous paste
Specific Gravity	– 0.96
Solubility	– Water-soluble–5% solutions recommended. Also soluble in kerosene and alcohol frothers.

For a sample of AEROMINE 2026 Promoter for trial in your own laboratory, fill in the coupon below.

Please send me a free sample of AEROMINE 2026 Promoter.

NAME_____

COMPANY_____

ADDRESS_____

_____

AMERICAN CYANAMID COMPANY

MINING CHEMICALS DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

NORTH AMERICAN CYANAMID LIMITED
160 Bloor Street East, Toronto 1, Ontario, Canada

CYANAMID DE MEXICO, S. A.
Apartado No. 26012, Mexico 12, D. F., Mexico

CYANAMID OF GREAT BRITAIN LTD.
Bush House, Aldwych, London W. C. 2, England

SOUTH AFRICAN CYANAMID (PTY.) LTD.
P. O. Box 7552, Johannesburg, Union of South Africa

E. P. CADWELL
Belen 1043, Of. 6, Lima, Peru

G. B. O'MALLEY
377 Little Collins St., Melbourne C. 1, Australia

Cable Address — Limenitro, New York

"America's Newest Copper Producer"

For this new copper producer, Dorr-Oliver supplied the following equipment: *sixteen* 16′ x 35′ Dorr Classifiers handling 36,000 TPD; *three* giant 325′ dia. Dorr Thickeners, each almost twice the playing area of a football field; *one* 55′ dia. Dorr Hydroseparator; *twenty-two* 12″ DorrClone units in the regrind section; *two* 100′ dia. Dorr Torq Thickeners; *two* 35′ x 20′ and *two* 10′ x 10′ Dorr Agitators; *one* 30′ dia. Dorr Type S Thickener; *one* Dorrco Lime Slaker; and *forty-one* Dorrco Duplex Diaphragm Pumps.

For more information on the complete line of D-O equipment for the mining industry write Dorr-Oliver Incorporated, Barry Place, Stamford, Connecticut.

DorrClone, Torq, T.M. Reg. U. S. Pat. Off.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

July 1957

INTERNATIONAL PANORAMA

SAN FRANCISCO, CALIFORNIA—The recent Homestake-Sapin Partners contract with the United States Atomic Energy Commission for a 1,500-ton-per-day Ambrosia Lake, New Mexico uranium mill calls for sale of up to 11,130,200 pounds of yellow cake concentrate.

TUCSON, ARIZONA—American Smelting and Refining Company bid $1,066,007 for exclusive prospecting rights in three areas totaling 15,423 acres in the Papago Indian Reservation.

LIMA, PERU—Cerro de Pasco Corporation has developed 100,000,000 tons of 1.5 percent copper ore at its Peruvian Antamina property. In Chile 85,000,000 tons of probably and possible copper ore of similar grade have been indicated at the Rio Blanco property. Exploration is continuing at both.

PRESCOTT, ARIZONA—International Ranwick Ltd. has indicated 14,000,000 tons of low-grade copper-molybdenum ore at Copper Basin. Of this tonnage 4,000,000 averages 0.913 percent copper and 0.124 molybdenite.

ESTERHAZY, SASKATCHEWAN, CANADA—International Minerals and Chemical Corporation will sink a 3,000-foot shaft to develop a high-grade potash bed here. A refinery will also be built. Operations are directed by the Canadian subsidiary—International Minerals and Chemical Corporation (Canada) Ltd.

SAN FRANCISCO, CALIFORNIA—Natomas Company, a leading gold dredging firm, has joined Pacific Tin Consolidated Corporation in a joint venture to dredge diamonds in French Equatorial Africa. Pacific Tin will manage the operation.

GEORGETOWN, BRITISH GUIANA—The Northwest Guiana Mining Company Ltd. will develop new manganese mines and is scheduled to mine and ship 10,000 tons per month in 1959 and 30,000 in 1961.

CATTOLICA ERACLEA, SICILY—Production of potash salts at the rate of 150,000 annual tons will soon be started by two firms. Reserves have been estimated as high as 200,000,000 tons of 12 percent K_2O in beds from 1,000 to 2,500 feet deep.

CANON CITY, COLORADO—The Cotter Corporation has received a one-year uranium concentrate purchase contract from the United States Atomic Energy Commission. Cotter will build and operate a pilot plant for Front Range ores so as to develop a commercial flowsheet.

PRETORIA, UNION OF SOUTH AFRICA—Minerals Engineering Company of South Africa, Ltd., a United States company is building a vanadium mill near here with production scheduled for September. Mining will be by open pitting.

SOGNDAL, NORWAY—National Lead Company's subsidiary, Titania A/S, will develop an open-pit ilmenite mine at the 350,000,000-ton Telnes deposit, build a 3,100-ton-per-day mill, and produce 300,000 annual tons of ilmenite concentrate starting in 1960.

LUANSHYA, NORTHERN RHODESIA—Roan Antelope Copper Mines, Ltd. and Mufulira Copper Mines, Ltd. have cut copper production by 10 percent so that copper supply and demand will be in better balance. Development continues at both mines.

WASHINGTON, D. C.—The Commodity Credit Corporation has resumed its barter program on a limited scale for strategic minerals. Last barters under the old program in April were for ferromanganese, $5,400,000; lead, $2,800,000; and zinc, $20,700,000. Under new program the following are acceptable: aluminum, antimony, amosite asbestos, bauxite, chromite, copper fluorspar, lead, manganese, mica, palladium, selenium, and zinc.

SEVEN ISLANDS, QUEBEC—Pickands Mather & Co. and the Steel Company of Canada, Limited have formed Wabash Iron Company, with PM acting as managing agent, to take over Canadian Javelin, Limited's extensive low-grade iron ore deposits 224 miles north of here. Necessary exploration, ore testing, and economical studies to bring property into production are underway.

St. Joseph Lead To Share In Peruvian Development

Cia. Minerales Santander, Inc. was incorporated in Delaware recently to develop lead-zinc-copper-silver deposits near the headwaters of the Chancay River, west of the Rio Pallanga mine in Peru. St. Joseph Lead Company holds 60 percent of the stock and will invest, in part as a loan, about $1,500,000 for the construction of a 500-ton-per-day selective flotation mill and a power plant to get the property in operation by the latter half of 1958. Santander Mining Company, owner of the property, retains 40 percent of the new company stock.

Diamond drilling carried out by the New Verde Company in 1929-1930 showed the property to have a proven reserve of 4,000,000 tons of ore. St. Joseph Lead Company's chief geologist, Edgar R. Lee, recently visited the deposits and estimates an additional possible reserve of 3,000,000 tons.

Grade of Santander ore is reportedly 12 percent zinc, 2.5 percent lead, 0.5 percent copper, and 3.0 ounces silver per ton.

The Peruvian firm, Administradora de Mines S.A., will supervise operations.

Radorock Controls 1,200 Gas Hills Uranium Claims

Radorock Resources, Inc. has signed an agreement to operate a uranium mine and 424 claims held by Ran-Rex Oil and Mining Company, bringing to more than 1,200 the number of claims held or to be operated by the company in the Gas Hills uranium field of central Wyoming. Included in the claims are another mine and several partially blocked out ore bodies. The latest agreement was announced in Salt Lake City, Utah by R. W. Neyman, president of Radorock, and Harvey R. Feller of Bountiful, Utah, president of Ran-Rex.

Radorock, a 52-percent-owned subsidiary of Floyd Odlum's Federal Uranium Corporation, will be operator of the mine and claims and will share in profits with Ran-Rex. An open-pit mine, from which ore has been shipped for more than a year, is now producing, with shipments restricted to the AEC quota of 600 tons per month. The ore averages 0.20 U_3O_8. Some ore is stockpiled at the mine and an additional 15,000 tons has been blocked out. Radorock drilling crews are to further delineate other ore discovered to date and to search for new deposits.

In previous transactions, Radorock agreed to operate 500 claims and a producing mine of Gas Hills Uranium Co. and 300 claims belonging to Amrad Oil & Minerals Corp. It paid Gas Hills Uranium $100,000 in cash agreed to perform 100,000 feet of test drilling and to share in profits. Radorock will also share profits with Amrad.

Next Month – Iron Ore Beneficiation at Hanna's Hunner Plant

SOLVENT EXTRACTION is key to high uranium recovery at Climax Uranium Company's Grand Junction, Colorado mill.

Solvent Extraction at Climax Uranium Proves These Advantages

- Lower costs, both capital and operating.
- Ease and simplicity of unit operation.
- Ease of process control.
- True continuous system.
- No poisoning of extractant by interfering elements.
- High recovery. At times 99.5 percent of solubilized uranium.
- Circuit flexibility.
- Yields very high-grade concentrate.
- No problems in stripping uranium from solvent.

By GEORGE O. ARGALL, JR.

Climax Uranium Company is operating, and very successfully, too, a commercial-scale uranium solvent extraction plant at its Grand Junction, Colorado uranium-vanadium mill.

Climax, because of its existing milling circuit, has the additional advantage of preserving and recycling acid solutions for neutralizing lime in mill feed. Climax is also fortunate that the plant's sand-slime separation, and, incidentally, this was the first on the Colorado Plateau, yields a high-grade aqueous solution for solvent extraction. Some solids are present in this solution but a crystal clear liquor is not a prerequisite for the process.

Adopt Proven Process

When the mill was first placed in operation in 1950, uranium was recovered by phosphate precipitation.

At that time solvent extraction was only a laboratory dream. However, the United States Atomic Energy Commission's research program at Union Carbide and Carbon Corporation's Oak Ridge, Tennessee laboratory; the work of the Dow Chemical Company; and that of the Salt Lake City, Utah experimental station of the U. S. Bureau of Mines showed conclusively the commercial feasibility of solvent extraction. Climax secured the laboratory results and initiated a testing program in its Grand Junction laboratory. The test program was so successful that the decision was made to proceed to a full-scale commercial plant.

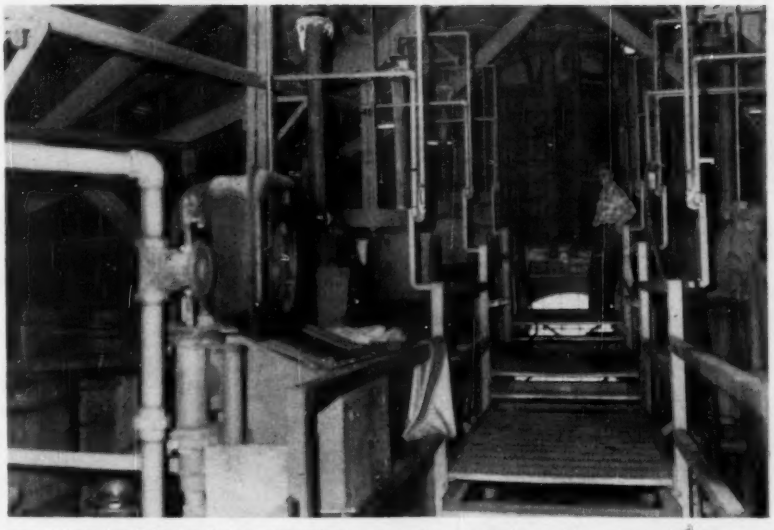
Vanadium recovery is important at Climax and solvent extraction of the uranium is done after the vanadium water leach. That is, the pregnant filtrate from three-stage, counter-current drum filters is the solvent extraction feed. This filtrate contains less than 0.5 percent solids, has a pH of 0.1 to 0.5, is highly oxidized, has an E.M.F. of 760, and contains 7.0 grams of U_3O_8 per liter, 8.0 of V_2O_5, 2.0 of Fe, 70.0 of SO_4, 2.0 of PO_4, 3.0 of A1, and 2.0 of C1. Iron content of feed ore is considered low. Iron is held in the plus-three valence to prevent solvent loading with subsequent contamination of the uranum di-uranate precipitate. Vanadium loading is minimized by controlling the contration of extractant. A reasonably clear filtrate is essential because a percentage of solids higher than 0.5 causes a persistent emulsion to form in the organic liquor with detrimental physical entrapment and loss of the extractant.

Pregnant filtrate is stored in three 11- by 18-foot storage tanks so that one is on filling cycle, a second on discharge, and a third being analyzed and ready for solvent feed. From these storage tanks, aqueous solution is pumped to a 4- by 4-foot, wooden, steady-head tank at the head of the solvent extraction section. This tank prevents surges and assures a uniform feed to the flowmeter controlling the circuit.

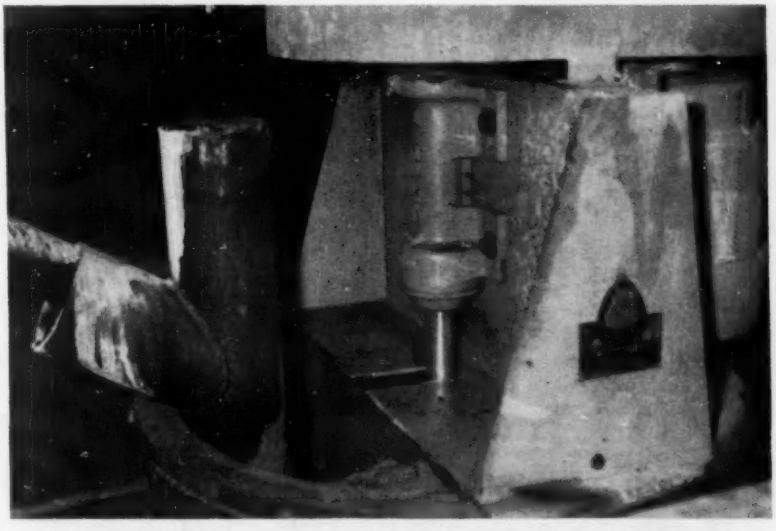
Three Component System

The solvent extraction unit at Climax is a closed circuit with six stages of extraction and four stages of stripping. Actually, it is a three-component closed circuit system as follows :

1. Aqueous.
2. Extractant. (organic phase)
3. Stripping.



URANIUM EXTRACTION CIRCUIT in the Climax mill is small in size and easily controlled and operated. The solvent extraction section is at left and the stripping section to the right of center runway.



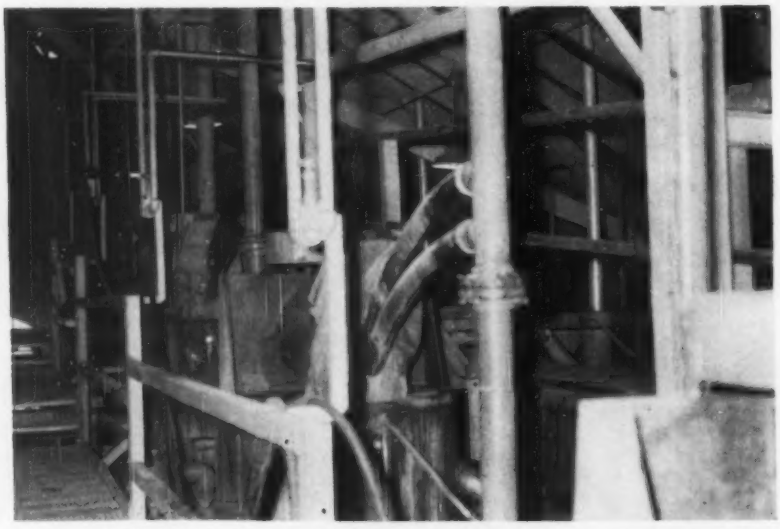
MIXERS are 316 stainless steel Denver agitators with turbine type propellors. Mixer tanks are 3 by 5 foot wooden stave with wooden baffles set at 90°. Propellor speed of 380 revolutions per minute assures adequate mixing.

In the system as a whole, the aqueous is the feed, the raffinate from sixth extraction stage is the tailing, the stripped solution from the fourth stripping stage is the concentrate, and the extractant is a recycling inter-circuit solution.

In the entire system there are two counter-current circuits. The first is extraction where the aqueous is always moved uphill by air lifts, but downstream in the circuit against the upstream gravity flow of the organic phase. The second is the stripping circuit where the stripping solution is advanced upstream (by airlifts) counter-current to the organic phase.

Extraction

Extraction takes place in six mixers and six settlers. Mixers are 3- by 5-foot wooden stave tanks with wooden baffles set at 90°. Each tank is equipped with a five-horsepower Denver agitator equipped with a stainless steel, turbine-type impeller rotating at 380 revolutions per minute. Settlers are also wooden stave tanks, 7 feet in diameter by 5 feet high. Each



STRIPPING SECTION showing the agitators in the foreground and the settlers behind them to the right. Stripping solution, Na_2CO_3, is air lifted through four stages and the loaded organic gravitates through circuit.

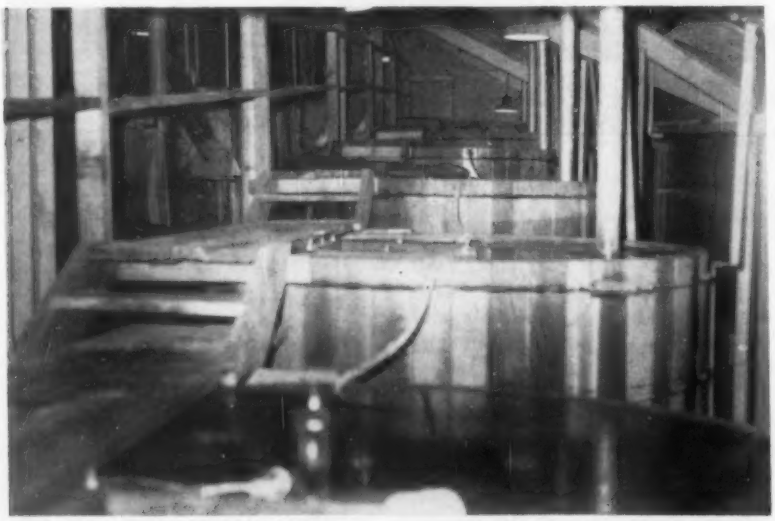
settler tank has a pie shaped baffle, from the periphery to the center, so that solutions must flow around and throughout the tank before being drawn off.

In the first mixer the aqueous is violently agitated with organic from first settler for at least one minute. Overflow from mixer gravitates to first settler where phase disengagement takes place quite rapidly. The aqueous has a specific gravity of 1.08 and the organic 0.83 to 0.90 so separation is sharp and clear. A U-shaped "Jackleg" hose is moved up or down to control interphasial level as desired.

The aqueous underflow from settler is air lifted to the second mixer. The organic (now loaded with uranium) is pumped by a 2-inch Wilfley pump to storage ahead of the stripping circuit.

Mixing and settling is carried through six stages to assure the raffinate tailing having only a uranium content of 0.01 gram per liter. Laboratory testing indicated that four stages were sufficient, but the plant was built with six to provide a safety factor and allow repairs on any mixer or settler without closing down entire unit. Organic enters this circuit through a flowmeter to the sixth mixer.

Raffinate from the sixth settler flows to 20-foot storage tanks to be used as needed to neutralize the lime in the mill feed.



SETTLER TANKS in stripping section. Note pools of standing water on top of the tanks to keep them swelled tight. Pools are about one inch deep on top of the wood deck. Solutions in tanks can be checked through trap door in deck.

Stripping

Uranium is stripped from the loaded organic with a 10 percent solution of sodium carbonate (Na_2CO_3). Organic is tailing from this circuit and is recycled to the organic storage tank ahead of the extraction section. The loaded carbonate (50 to 60 grams per liter of U_3O_8) solution is the concentrate and flows by gravity to one of two 11- by 18-foot precipitation tanks. The stripping circuit uses exactly the same type mixers and settlers as the extractant circuit; however, only four stages are necessary. Sodium carbonate solution enters the first mixer and is air lifted through the four stages. The loaded organic enters circuit through a recording flowmeter at the fourth mixer. It gravitates through circuit and is taken off top of first settler tank and returned to the extraction circuit.

Uranium is precipitated from the loaded carbonate solution by pH adjustment and addition of ammonia. Precipitation takes place in either of two 11- by 18-foot wood stave tanks. The stripped solution is brought to a pH of 4.0 by sulphuric acid addition, heated to 80° C., and agitated until all excess CO_2 has been driven off. Ammonia is then added to a pH of 7.0 which precipitates the uranium as a mixture of ammonium and sodium diuranate. The precipitate is pumped to a 36-inch plate-and-frame filter press where it is filtered and washed.

Control by Flow Rates

The system was designed to insure easy positive control. By using flowmeters accurate records can be maintained as a guide to plant operation. Operators use nomographs and flowmeter readings for regulating flow rates: (1) to maintain a slightly higher organic flow rate than aqueous to insure operation of the extraction system as an organic continuous phase to eliminate any emulsification; (2) to insure maximum uranium loading of the extractant; and (3) to load the carbonate stripping solution to 50 to 60 grams per liter of U_3O_8 to conserve reagents.

Major control is the adjustment of aqueous flow in accordance with its uranium concentration. The organic flow rate is adjusted so as to assure 90

Learn and Use These Solvent Extraction Terms

AQUEOUS LIQUOR: Uranium-rich, pregnant, pulp, filtrate, or solution. This is feed to solvent extraction unit. In commercial mills it is the acidic leach filtrate or slurry. It is also a carbonate liquor in test work.

CARRIER SOLVENT, sometimes referred to as DILUENT: An inert organic compound, usually kerosene, in which the organic extractant is dissolved. Kerosene is used because it is immiscible with aqueous solution, is low in cost, and has a relatively high flash point (safer to use).

In a multi-phase carrier solvent system kerosene has been most effective diluent and forms 90 to 95 percent of system. In order to maintain reagent-diluent compatibility during alkaline stripping operations, it may be useful to modify the kerosene with a small amount of additional solvent.

PHASE MODIFIER: Tributyl phosphate, therefore, is added to carrier solvent and extractant in an amount equal to 2.5 to 3.0 percent of total volume. In stripping, the sodium salt of Di 2-ethylhexyl phosphoric acid is formed (see stripping). This salt is not appreciably soluble in either the kerosene carrier or the carbonate solution, but forms a third phase if the tributyl phosphate is not present.

The tributyl phosphate causes the sodium salt of extractant to be soluble in the organic layer, thus preventing the formation of a third phase and ensures that the extractant remains in the organic phase. The tributyl phosphate also causes the Di 2-ethylhexyl phosphoric acid to extract the uranium faster and therefore requires fewer stages for extraction.

EMULSION BREAKING RATE: Rate of phase disengagement (see below).

EXTRACTANT or SOLVENT: Organic chemical solvent having greater affinity for certain metallic compounds than does the solution. Has low solubility in aqueous phase but high solubility in an organic carrier solvent. Must be chemically and thermally stable. Di 2-ethylhexyl phosphoric acid is an excellent extractant for uranium. It has the further advantage of ready availability in quantity at reasonable cost. Forms about 3.0 percent of organic.

EXTRACTION COEFFICIENT: For uranium this is the ratio of the uranium concentration in the organic (extractant) phase to that in the aqueous phase, at equilibrium.

LOADED: Synonomous with pregnant. Usually considered only when speaking of the organic phase.

ORGANIC CONTINUOUS PHASE: This is established in mixer by having a slightly higher organic than aqueous flow rate. Minimizes the emulsification tendencies of two solutions.

ORGANIC LIQUOR or ORGANIC: Carrier solvent system. Usually multi-component. Must have low order of water solubility.

PHASE DISENGAGEMENT: Separation between organic (extractant) and aqueous (initial carrier) solutions. Specific gravity differences, immiscibility, etc. cause phase disengagement.

POISONING: Fouling of the extractant to reduce the uranium extraction coefficient. Molybdenum, cobalt, titanium, thorium, and ferric iron are poisons. Dilute hydrofluoric acid will remove titanium and thorium. Sodium sulphide, powdered iron, and other reducing agents remove ferric iron.

PRECIPITATION: Removal of uranium compounds from stripping solution. The uranium is precipitated from an acidic solution by addition of anhydrous ammonia or magnesium oxide. Chemical reaction would be first for acidulation, and second for precipitation:

1. $Na_4UO_2(CO_3) + 3\,H_2SO_4 \rightarrow UO_2^{++} + 3SO_4 + 3CO_2 + 3H_2O$
2. $UO_2^{++} + 2H^+ + 2\,NH_4 \rightarrow (NH_4)_2\,U_2O_7 + H_2O$

RAFFINATE: Uranium-poor tailing from solvent extraction. It is the aqueous solution after uranium removal. An acidic solution which is used in some mills to neutralize the lime in mill feed.

RESIDENCE TIME: Theoretical period of solution retention in tank volume. Same as contact or conditioning time in flotation.

SATURATION LIMIT: Point of maximum metal loading in extractant. Expressed in grams of metal per liter.

SELECTIVITY: Ability of a solvent, reagent, or mixture to extract one element or group of elements to a much greater degree than other elements in the system.

SOLVENT EXTRACTION: The selective transfer of metallic compounds from aqueous hydrometallurgical solutions or pulps with an organic chemical solvent which is immiscible with aqueous solution. Metals are then removed from the solvent (extractant) in a more concentrated, higher purity, or usable form by stripping with a sodium carbonate solution. The final step is precipitating uranium from the pregnant carbonate solution by addition of acid to destroy the carbonate followed by standard yellow cake precipitation with either magnesia or ammonia.

It is a multi-stage continuous, counter-current, contact process, usually using a series of mixer settler tanks with Di 2-ethylhexyl phosphoric acid and tributyl phosphate dissolved in a carrier solvent.

Solvent extraction of uranium from acid liquors by dialkylphosphoric acids may be regarded as a reversible chemical

Continued on page 106

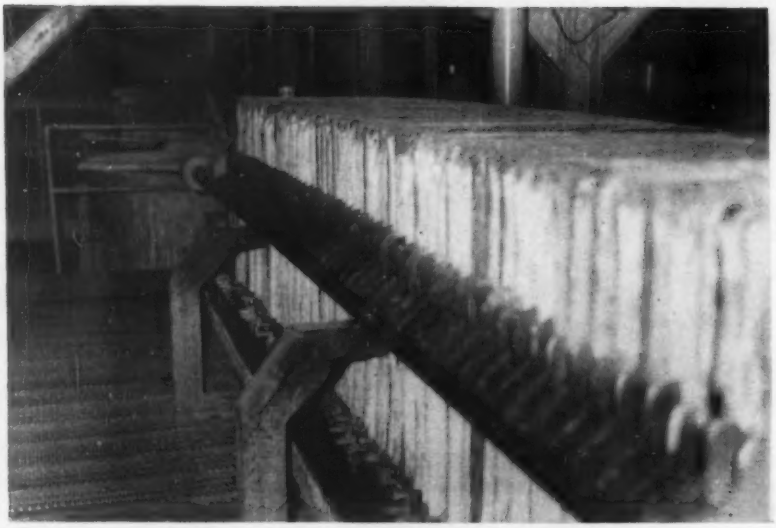


PLATE AND FRAME filter presses are used to recover the yellow cake uranium precipitate; a mixture of ammonium and sodium diuranate which averages 85.46 percent U_3O_8 and just over 1.0 percent V_2O_5.

Uranium and Vanadium Concentrations In Various Circuits, and Extraction Results at Climax Uranium Company's Solvent Extraction Unit

Solution	*Grams U_3O_8 Per Liter*	*Grams V_2O_5 Per Liter*	*Percent U_3O_8*	*Percent V_2O_5*
Pregnant Aqueous[1]	5.89	6.96	—	—
Raffinate	0.01	6.58	—	—
Loaded organic	5.85	0.06	—	—
Loaded carbonate[2]	62.52	1.86	—	—
Stripped organic	0.01	NIL	—	—
Concentrate	—	—	85.46	1.04

1. pH is 0.5. 2. Extraction is 99.9 percent.

percent of theoretical uranium loading coefficient in the circuit.

It is especially important to load extractant to capacity in order to prevent secondary loading of vanadium and poisoning elements, such as iron, molybdenum, titanium, etc. Also the organic flow rate must be high enough to extract all uranium from aqueous in order to hold uranium content of the raffinate (tailing) at an absolute minimum.

The Equipment

All mixers and settlers are fir stave tanks. The settler tanks have a covering deck which has a standing layer of water on it to insure swelling of the staves to prevent leakage. Each tank is constructed with a hollow column along each stave joint. These columns are interconnected, top and bottom, through a hole drilled through the long dimension of each stave. Water is circulated continuously through these water rings to insure maximum tightness of the tank.

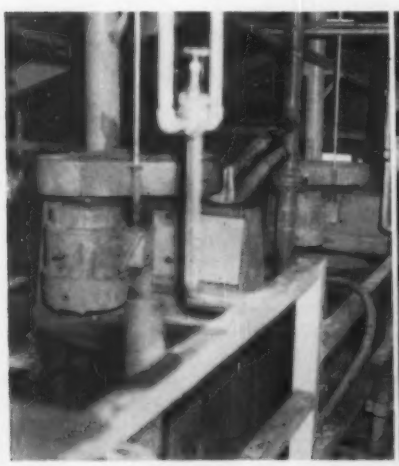
All agitators, tank fittings, etc. are 316 stainless steel to prevent corrosion. Only three Wilfley pumps, stainless steel, are necessary for the system proper. They operate against low heads for pumping. (1) loaded organic to stripping circuit; (2) stripped organic to extraction circuit; and (3) solvent make-up from mixing tank to solvent storage tank (intermittent operation for only a few minutes). In addition, pumps are used to supply pregnant aqueous solution and soda ash stripping solution to steady head tanks feeding the process.

Airlifts with only a four-foot head are used to elevate the aqueous through the circuit. Unplasticized poly-vinyl chloride is used for air lift parts and hoses. Note details in photographs. Neoprene is unusable because it is attacked by the tributyl phosphate in the organic.

Reagent Cost

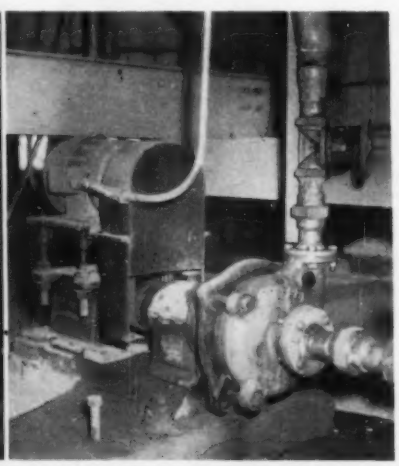
Low reagent cost is one of the advantageous aspects of solvent extraction and at Climax has been only $0.15 per pound of U_3O_8 recovered. Solvent cost has been 2 cents; soda ash, 8 cents; sulphuric acid, 4 cents; and ammonia, 1 cent. Solvent loss or make up cost has been minimized to 1.6 gallons per 1,000 gallons of aqueous feed. This loss includes spillage, evaporation, and solubility and entrainment in the raffinate and the pregnant carbonate.

Climax is very pleased with solvent extraction of uranium. In fact, operational results have been better than laboratory piloting. Testing is underway for vanadium recovery by solvent extraction.



EXTRACTION SECTION provides one minutes contact time between organic and aqueous in each of six stages.

AIR LIFT PARTS and solution transfer hoses are all made from unplasticized polyvinyl chloride.



STAINLESS STEEL WILFLEY pumps are used in system. This one is pumping loaded organic to stripping circuit.

SORTING MACHINE, made by Remington-Rand, will process a stack of punched cards at a rate of 420 per minute. It will remove cards punched with a certain code number so that the coded data can be later transcribed into reports.

Punched Cards Speed Homestake's Operating and Mine Cost Reports

Homestake Mining Company, top United States gold producer, figures that it costs the firm $26.00 to $27.00 to produce an ounce of gold from its mine at Lead, South Dakota. With the price of gold pegged at $35.00 an ounce, intelligent management must keep a close eye on costs to meet the squeeze on profits. Modern business machines have proved to be management's road to decision at Homestake, by rapidly turning out accurate, up-to-date reports which keep the management informed of daily results of the operation. Mechanized accounting and the punched card are really the force behind the man with the drill or mucking machine.

In 1949, Homestake overhauled the general accounting system then employed, and purchased a battery of Remington-Rand business machines. A newly created Tabulating Division of the Accounting Department was established and William Morcom, trained by Remington Rand, was hired to head the new division. The business machines made it possible to streamline the handling of the bi-monthly payment of 1,700 day's-pay and 200 salaried individuals. Annual ore reports which once took about two weeks to complete are now prepared with a total machine-time of about two hours.

Flowing into the tabulating division is the basic information contained on employee time slips, warehouse requisitions, explosives issued, and purchases for warehouse inventory. Flowing out of the tabulating division are the paychecks, and data needed to post the general ledger, operating ledgers, and to prepare various detailed, routine and general reports for supervisors. Make no mistake about it, mechanized accounting isn't a function which can be entirely performed by business machines; nor do business machines eliminate the need for clerks. However, the processing of the monumental stack of daily, weekly, monthly, and annual records is greatly speeded and done more accurately.

Card Punching

Practically all records are now based on the punched card. Any written data which will lend itself to coding by a number or a group of numbers can be transcribed to a punched card. Just as unit operations are handy in describing ore processing, so they are useful in outlining the important function of maintaining records and compiling statistics.

The first unit operation is card punching. This is done by operators sitting at a key punch machine. Using time slips, requisitions, etc. as the source, key-punch operators enter coded data on the cards. Actually each card will accommodate several types of coded information. The punched card stores the information; and this data can be read, recorded, and printed by other machines at a faster, more efficient rate than by humans.

Monthly Tally of Punched Cards at Homestake Mining Company, Lead, South Dakota—Based on 24 Working Days in Month

3,000	cards per day are punched for payroll purposes and for labor cost information going into the ledgers.
300	cards per day are cut showing drill footage per machine and cars loaded per shovel.
150	daily ore cards are cut.
300 to 350	cards are punched each day with warehouse issues information.
75,000	cards are punched for weekly summaries.
8,000 to 10,000	cards per month are punched for general ledgers.
5,000	payroll deduction cards are punched.
500	cards per month must be punched to maintain the personnel register.
2,500	cards per month must be punched for accounts payable.
20,000	cards are punched from miscellaneous sources of information. One important card in this category is a card showing daily explosives issued.
201,000	Approximate total punched cards per month.

The second unit process involved is card sorting. Each month over 200,000 cards are punched by the tabulating division. Card sorting machines will process a group of cards removing those that are punched with any desired code. The third unit operation utilized is reading and transcription of the information contained on the punched card. The data is reproduced in numerical or written form. In some cases the automatically reproduced data is an end report in itself; and in other cases it is simply data which must be further processed.

Business Machines

The assembly of weird-looking machines accomplishing these basic functions are housed on the lower floor of Homestake's general office building on Lead's main street. Key punch machines are operated much like a typewriter. The operator at the keyboard uses a touch system and transfers the information from the time slip or other media to a blank card. A second machine, known as a verifying machine, checks every punched hole in each card and identifies any cards that are punched with errors. This mechanical marvel processes 200 cards per minute .To eliminate the necessity for reading the holes in the cards, an interpreting machine decodes the punched information and prints it on the face of the card as though it were done by a typewriter. The interpreter prints 100 cards per minute. Still another unit, the sorting machine, is capable of scanning a set of punched cards, removing those cards punched with a certain code number. The sorting machine will process up to 420 cards per minute.

Another machine multiplies, figures, and prints the results. Information to this machine is fed from punched cards, and it will handle multiplications of a 6-digit number by a 6-digit number down to the simplest 2-by-2 calculation at a constant rate of 20 problems per minute. The answers are punched on cards and printed on a tape similar to an adding machine. A numerical tabulator and summary punch machine is also indispensable to the operation. The tabulator is the equivalent of 10 adding machines and it processes the information at 100 cards per minute. The totals are automatically punched onto summary cards, as well as being tabulated and printed on a wide tape.

By-Product Data

The foregoing are the machines used by Homestake to speed up the accounting process. Actually a great deal of the work done by the tabulating division is a by-product of the normal payroll function. The information collected to meet the payroll is invaluable in preparing labor-cost summaries, posting books, and compiling statistical data for the mining and metallurgical departments. Punched card data supplies the management with personnel statistics; pension information; mine contract analysis reports; haulage reports by air and electric motor; power shovel and scraper performance; explosive data and consumption; warehouse supplies issued analysis; and accounts payable analysis to mention a few basic reports.

Certain statistical studies can be undertaken by the tabulating division which are invaluable in improving mining or metallurgical operations. For instance, Homestake for the past several years has conducted a close study of rock drills for analyzing the performance of each machine. Each rock drill is assigned a number, and each miner reports the drill number, number of holes, and footage on his daily time slip. Cards are punched with the date, contract number, level, type of mining code, machine number, number of holes drilled, number of feet drilled, and the hours spent in drilling. From these daily cards, monthly reports are obtained showing the drill footage, time spent in drilling, and number of holes drilled. These reports are classified by each individual drill; by type of drill (stoper, airleg or liner); by type of mining operation; and for the entire mine. The rock drill data is compiled in a fraction of the time required to do the job manually.

Studies like this over a period of time can do a lot for management in helping it formulate buying decisions. The statistics allow them to arrive at basic conclusions where conditions can be improved. Any special study such as the foregoing can be undertaken. The only thing required is a slightly redesigned time slip so that the basic data can be given a code

How Mechanized Accounting Works

Business machines streamline the handling of payrolls and preparation of mine operating and cost accounts at Homestake Mining Company, Lead, South Dakota. Flowing into the tabulating division of the accounting department is the basic and often times hand-written information contained on time slips, warehouse requisitions, explosives issued and purchases for warehouse inventory. This information is coded and punched into a card; the cards can be mechanically sorted and transcribed faster than can be done by hand. In the example at the right the miners' explosive report and time slip are batched and sent to the tabulating division. The girls at the key punch machines enter the data on several cards which then become the basis for cost control.

HOMESTAKE MINING COMPANY

CONTRACTORS' EXPLOSIVE REPORT

Kind of Powder	Sticks	½ Type	No. 8 Caps	Q Drill	Fuse Sticks	Fuse Sticks	2 to 10 Sticks		Lbs. Kgs.
Received									
Returned									
Used									

	Type Mining	Account No.									
Big Holes											
Short Holes											
Chute											
Other											

Description of Other

Date	Level	Place	Miner Correct	Pandleman Correct	Job No.

CONTRACT

HOMESTAKE MINING COMPANY
TIME REPORT—MINE DEPARTMENT

DAY SHIFT

Mark Steps Worked in Proper Spaces Below — CHECK EMPLOYEE NUMBERS CAREFULLY!

Driving	Raising	Drifting	Shrink	Open Cut & Fill	Open Cut & Fill Square Set	Square Set	Waste Fill	Underbreaking	CLASS OF WORK	Account Number	Job Number	Hours Worked	Rate Change
									Drill, Shoot, Bar Turn, Slusher Back				
									Power, Hand Shovel Trucking				
									Draw Chute				
									Timbering				
									Back Balling				
									L.P. Air Lines				
									Water Lines				
									H.P. Air Lines				
									Sand Pipe				
									Dump Ore Into				
									Dump Waste Into				
									Ventilation				
									Install Track				
									Clean Track				
									Powder Magazine				
									Other Work (Describe)				
									Mark Drilling, Power Shovel, Slusher, and Total Cars Information on Back of This Report		Total Hrs. Worked		

LEVEL ..... PLACE .....
LEVEL ..... PLACE .....

Contract — Shift Boss — Employee
Contractor — Date — Employee No.

AIR DRILLS USED
Check Square Below Where Drilling Was Done

Machine Number	1	2	3	4	5	6	7	8	9	Holes Drilled	Ft Drilled	Hrs.
	Raise	Drift	Shrink	Pillar	Crown	Open Cut & Fill	Sq. Set Timbering					

POWER SHOVELS USED
Check Square Below Where Shoveling Was Done

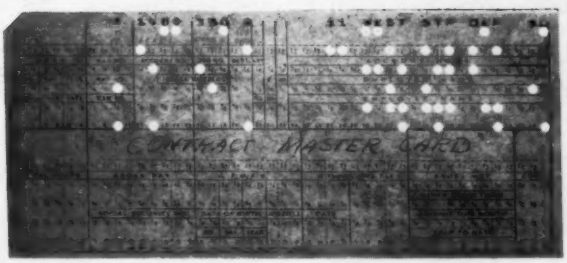
Shovel No.	1	2	3	4	5	6	7	8	9	Cars Shoveled: Ore	Waste	Sand
	Raise	Drift	Shrink	Pillar	Crown	Open Cut & Fill	Sq. Set Timbering					

SLUSHERS USED
Check Square Below Where Shoveling Was Done

Slusher No.	1	2	3	4	5	6	7	8	9			
	Raise	Drift	Shrink	Pillar	Crown	Open Cut & Fill	Sq. Set Timbering					

TOTAL CARS

Type	Loaded	To Shaft	Standing
Grizzly			
Small			



Examples of Punched Cards at Homestake Mining Company, Lead, South Dakota

Card Name	Information Punched on Card	Source of Information
Footage drilled and power shovel card	Date, type of mining, contract or job number, machine number, and feet drilled, or cars mucked.	From miner's time slip
Personnel master card	Continuous service record, man number, employee name, department basic shift rate, marital status, number of exemptions, F.O.A.B. status, pension data, social security number, date of birth, education, and job classification code.	From the employee and other sources
General ledger card	Date, account number, job number, journal number, department, account name or description, and amount.	From various sources
Daily time distribution card	Date, man number, account number, job or contract number, department shift rate, hours, shift (day or night), batch number, basic rate, and extended earnings.	From time slips
Warehouse issues card	Date, warehouse number, account number, job or contract number, serial number, and amount.	From warehouse requisitions
Explosives issued card	Date, account number, job or contract number, type of explosives, quantity, cost factor, and amount (dollars).	From slips left in powder magazines when explosives are withdrawn and from slips filled out by bosses
Daily ore card	Date, locomotive number, type of mining, level, contract or job number, contract chute number, location (which is broken down by stope number, stope section letters, type of mining, timber-cut-and-fill or open-cut-and-fill, and ore body), and number of cars.	From motorman's time slip
Contract master card	Date, type of mining, contract number, ore body, stope number, stope section, timber cut and fill or open cut and fill.	From contract engineer

number which can be entered on the punched card.

Source of Data

Since the time slip is one of the basic elements entering into punched card accounting, let's follow the routing. Individual time slips are batched according to day shift or night shift, and further broken down by department or division and worker classification. The miner or worker fills in the number of hours spent at each job, together with his man number. The latter number is assigned to each individual when he is hired and is an important code for payroll purposes. Where special studies are made, a form is provided on the time slip which the miner can easily complete. See the form provided on the back of the underground employee's time slip for an example.

Clerks in the mine office total the number of hours by batches; for example, by motormen, shaftmen, miners etc. They also enter the number of the account which should be charged for each class of work shown on the time slip. Absent slips are issued to check on men who may have forgotten to turn in a time slip at the end of the shift.

The batched time slips with hourly totals are then sent downtown to the tabulating division where they are processed by key punch operators. Specifically, cards are punched for each man showing the hours worked and other data necessary for paying the worker. These cards are also punched with the operating accounts involved by the work done during the day so that these accounts can be charged. Any other special information included on the time slip form is punched into a card.

The motormen's daily time slip provides the information necessary for ore-production reports. Included on this time slip are spaces for noting the number of cars hauled from development headings or stopes; if the ore comes from a contracted stope, the contract number and car tally will show on this time slip.

From all these various sources, daily cards are punched. At the end of each week, the data on each batch of daily cards is totaled so that weekly summary cards can be punched. Similarly monthly-summary and year-to-date cards are prepared each month.

Tracing the mechanics of maintaining the records and issuing reports is too complicated and involved to describe in detail. A few general examples will follow which show how the information gathered and punched into the cards can be put to use.

Mine Contract Operations

Data essential to keeping work done by contract in up-to-date form is greatly speeded. Stoping at Homestake is either square-set cut and fill or open cut and fill. The latter is being adopted wherever possible and most of the work is done by that method. Open cut and fill contracts are paid when the stope is finished. This method has its advantages, but a stope may be worked for three months before it is finished. This makes it necessary to maintain careful records and have them up to date for inspection at any time. The company will advance up to 80 percent of the contract earnings at any pay period.

A contract operations sheet is maintained at the mine office which shows the status of each and every contract. The tabulating department assembles the daily data needed to post the contract operations sheet using a numerical tabulator. The source of these data is contained in daily time distribution cards, the daily ore cards, and the daily explosives issued cards. These cards are fed into a numerical tabulator which adds and extends the totals and prints the result on a wide tape. The tapes show the date and contract number in each case; three tapes are forwarded to the mine office—one for the contract explosives used, another for the ore loaded, and the last one shows the contract time distribution. The mine clerks then post this data on the daily contract operations sheet.

Once each month the earnings for each contract are tabulated by the mine clerks who then fill in the unit cost data on the contract operations sheet. The contract operations sheets are sent to the tabulating department each month and the unit cost data is used to punch a new set of cards for mine contract analysis reports. The reports are summarized by contract number and type of mining, and is of interest to the contract engineers in the mine office for analyzing contract performance and determining rates per unit of work. Basic contract data is also forwarded to the mine superintendent.

The tabulating department also makes a list of contracts by foreman, showing the names of the key men, the contract number, level, and the location of the contract. This tape is used to prepare a master sheet of active contracts for the contract engineers and foremen.

Special Mine Reports

Routine and special mine reports prepared for supervisors and the management are largely under the supervision of an employee who worked underground for a number of years and is a trained key punch operator. This employee works closely with William Morcom, who is in charge of

the tabulating division, and he is able to combine his knowledge of mining with the specialized nature of business machine operation for rapid assembly of these reports. A key punch machine is located at the mine office for his use, and he serves as a liaison man between the mine and the tabulating department.

He is responsible for preparing several different reports which are described below. At the end of the month he prepares the drill reports mentioned earlier. One report goes to the drill engineer and is organized by machine number; this shows the contract or job number, the holes drilled, the hours drilled, and the total feet drilled. This data is obtained from the daily and weekly footage drilled cards. Another report of total footage by contract is sent to the mine timekeeper's office. A third report shows monthly footage by type of machine (stoper, airleg, etc.), and is necessary to prepare maintenance costs of mine rock drills. The actual maintenance costs must be determined from several sources of information such as replacement parts, labor involved in making repairs, etc. These data are contained in the month's accumulation of punched cards but machine card-sorting and reassembly rapidly extracts the needed information. The monthly maintenance report shows the number of units repaired, the footage drilled, cost of replacement parts, labor cost, total cost (labor plus parts), the average cost of maintenance, and the cost per foot drilled. Hose usage and ventilation tube data is also included on this report by totalling the data compiled on these units from punched cards. In a fourth report, using the monthly summary cards, total footage by type of mining is obtained and is entered on the basic contract data report.

Still another type of report which this liaison employee may be called upon to prepare is of specialized nature. For instance a rock drill manufacturer, who has developed a new piston for rock drills, may furnish a few of the new units to Homestake on a trial basis. Of course this is the best way to test equipment, but unless business machines were employed, a detailed study would be too time-consuming. The data collected are invaluable both to Homestake and the drill manufacturer.

Another function of this specialized mine clerk is preparation of haulage reports. Data from the motormen's time slips of course is the basic source; but by sorting out daily ore cards and weekly summary cards with these data, he rapidly prepares the haulage report showing the number of cars of waste hauled and the number of cars of sand (for backfill) hauled. This is broken down by type of locomotive, air or battery, and also includes ore hauled by these units. The haulage report goes to the accounting department and is included in a basic monthly cost report. From the daily ore cards, a monthly ore report goes to the mine for the contract operations report prepared by the mine clerks. Another monthly ore report is organized according to the type of work involved—drifting, raising, type of stoping—and still another is assembled by the ore-body classification.

Other specialized reports can be prepared by the tabulating department. Using a hypothetical example, suppose a mine manager, during labor negotiations, wanted to get a grouping of employees by length of service. This would ordinarily require a great deal of file searching by several people to produce the result. However, by using punched cards for record keeping, these data can be readily assembled in one to two hours.

It may not be a pleasant thought, but it takes a lot of paper work and a great many calculations to keep a mine running on an even keel. Certainly punched card accounting is one of the quickest and surest short-cuts to obtaining the greatest amount of detail with the least amount of effort.

THE END

INTERPRETER is a machine which reads the holes in the punched cards. It decodes the information and prints the data on the face of the card as though it were done with a typewriter. The interpreter automatically prints 100 cards per minute.

EXPLORATION HEADINGS are driven 20 feet below the stoping level at the Regal mine. Broken muck is removed and loaded into cars by portable ramp loaders on which are mounted double-drum Gardner-Denver air driven slushers.

How Low-Iron Chrysotile Asbestos Is

This unique mineral is given special consideration in the Long-Range Minerals Program outlined on page 59

By D. W. JAQUAYS and ALVIN W. GERHARDT

One of Arizona's most important small mines produces low-iron chrysotile asbestos. It is the Regal mine of the Jaquays Mining Corporation located on the south rim of the Salt River Canyon, 30 air miles north of Globe, in G.la County. This small operation with only 20 underground employees mines and hand sorts the ore to a value of $164.40 per ton before it is milled at Globe. Average value of the fiber (concentrate) from the mill in 1956 was $573.00 per ton.

While numerous varieties of asbestos occur throughout the United States, only in Vermont and Arizona are commercial deposits of chrysotile asbestos being mined. Only Arizona is noted for its naturally low-iron chrysotile fiber that is used as a filtering medium in chemical plants and meets the United States Navy specifications for use in covering electrical cables. The total United States production of this special type fiber is from Gila County.

Among the numerous deposits and small mines there are relatively few developed which contain commercial deposits of soft and semi-soft fibers of spinning grade. Total production of crude fiber from the area is approximately 1,000 tons per year of crudes and perhaps 2,000 tons of short fiberized grades. Less than 10 mines and four major producers are active in the area. The Regal mine

Mr. Jaquays is president and general manager of the Jaquays Mining Corporation and has been active in producing Arizona asbestos since 1950. Mr. Gerhardt is general superintendent.

COBBED ORE IS MILLED at Globe, Arizona by a crushing and screening process. Mill feed, containing 20 to 40 percent fiber, is trucked from the mine. The mill operates one shift daily to treat 15 tons of ore.

Mined and Milled in Central Arizona

produces about one-third of total output. Since 1952, production has been stimulated by the government buying program under the Defense Minerals Procurement Agency. A buying station under the General Services Administration was established in Globe as part of the program.

Asbestos was first discovered in the district in 1872. The rising market during World War I led to much activity and production. Since 1933, production there has been fairly continuous. The first claims in Regal mine area were located in 1915. Several companies owned the claims and worked the mine intermittently until the property was acquired by the Arizona Chrysotile Asbestos Company in 1937. This company made substantial yearly production until 1948 when the mill was destroyed by fire. Following this, little mining was done until an asbestos mill, which was standing idle in Globe, was acquired about a year later. This mill had been built with Defense Plant Corporation aid in 1943-1944 by the Southwestern Asbestos Corporation.

In 1950 the Arizona Chrysotile Asbestos Company turned the management of mine and mill over to D. W. Jaquays, mining engineer and consultant. In June 1952, the Jaquays Mining Corporation purchased the properties. Since acquisition of mine and mill by the present company, mill capacity, ore reserves, and production have been increased. Mr. Jaquays attributes much of the increased efficiency and production to capable assistants: Alvin W. Gerhardt, general superintendent; F. H. Padgett, mine superintendent; and W. Myers, mill foreman.

General Geology

The geological occurrence of asbestos in central Arizona is similar for the entire area. It occurs in bands paralleling the strata in the lower member of the Mescal limestone. This is part of the Apache group which has been tentatively determined as Cambrian.

The Mescal formation is composed of three members: The Lower Member (175 to 200 feet thick) in which the asbestos occurs is a thin bedded impure dolomitic limestone. Overlying it is the readily recognizable massive bedded algal (Middle Member) of relatively pure limestone (80 to

Value and Production of Asbestos Mined from 1954 through 1956 at the Regal Mine of Jaquays Mining Corporation, Gila County, Arizona

Item	*1954*	*1955*	*1956*
Square feet mined	26,000	35,900	37,000
Value per square foot	$15.10	$7.50	$10.66
Tons ore mined	13,500	17,950	18,500
Value per ton ore in face	$24.24	$15.00	$21.34
Tons ore milled	1,677	2,400	2,400
Value per ton milled	$234.12	$112.50	$164.40
Tons fiber recovered	500.1	550.27	690.0
Average value per ton of fiber	$785.25	$500.00	$573.00
Value of total production	$392.625	$273,309	$395,765

150 feet thick) which is composed almost entirely of spheroidal masses or nodules that have a concentric shell-like structure often several inches in diameter. The Upper Member (10 to 80 feet thick) is composed of siltstone, shales, and shaly limestone. The thin bedded and dolomitic Lower Member of the Mescal limestone has been intruded with numerous diabase dikes and sills.

Most mines in the district have been opened by adits on flat or nearly flat lying zones of asbestos and serpentine paralleling the limestone bedding planes. There are a few exceptions where the limestone beds have been faulted and tilted to such an angle that a shaft is necessary.

Geology of The Regal Mine

Regal mine geology is fairly typical of the area. The three members of the Mescal limestone, as well as the overlying Troy quartzite and underlying Dripping Spring quartzite, are exposed along the south side of the Salt River Canyon. Diabase intrusions may be seen which have cut and split the formations, merely pushing the beds apart with no assimilation of the limestone. The asbestos deposits are related to these diabase intrusions (either sills or dikes) and irregularities in diabase-limestone contacts which have warped or slightly folded the limestone beds. The proximity of the diabase to the dolomitic Mescal limestone is an important factor in the localization of asbestos deposits.

One structural feature at the Regal mine which seems to be an important factor in the concentration of asbestos has been the shattering and warping of the favorable beds by a belt of thrust faulting striking approximately S. 25° E. Mineralization is present on limbs of folds and flanks of a domed structure but concentration is greatest where small thrust faults meet the dipping beds. As the beds flatten, mineralization decreases.

Here, as elsewhere in the area, most asbestos deposits and serpentine veins are within the top 45 feet of the Lower Member of the Mescal. Asbestos-bearing serpentine zones occur at many horizons in the Regal mine. Only two are of major importance. These two serpentine-asbestos zones vary in thickness from a few inches to over two feet. The lower zone is approximately 35 feet below the algal limestone or 19 feet above the top of a thick concordant diabase sill. The other zone is about four feet higher. In the bedding, about one foot above the lower zone is a persistent band of dark green serpentine one to three inches thick, which is locally known as the "Oscar." It is found in all parts of the mine and is a reliable marker that indicates the favorable beds even when no fiber is present.

The asbestos is found in veins up to several inches in width within the bands of serpentine. These veins roughly parallel the serpentine bands but are seldom uniform in width or length. Larger veins of asbestos often split into small veins, or smaller veins coalesce to form larger veins, or either may pinch out completely. This tendency of veins to pinch out or swell makes probable ore reserves difficult to predict without considerable development.

MAIN PORTAL of the Regal mine on the south side of the Salt River Canyon north of Globe. Asbestos is found in veins up to several inches in thickness in bands of serpentine above a thick diabase sill.

The Regal Mine

Original discoveries at the Regal were made on an outcrop where asbestos was exposed for about 400 feet along the cliffs which overlook the Salt River. Several adits were driven, and eventually were connected as stoping of ore progressed. Only one of these, known as the main adit, has remained open and usable up to the

present time. In 1950, a portion of the cliff near the main adit caved and prevented shipments of ore until a new adit (No. 9) was driven almost at right angles to the main adit on the western slope of the mountain.

Most of the main ore body had been mined out by 1950 in a dome-shaped area some 500 feet wide by 400 feet long.

As the main drift was continued to the south, the bedding planes began to rise and the mineralized area began to widen. At about 800 feet from the portal, the drift encountered folded and faulted portions of the main Regal fault. The fiber lengthened and the stoping area widened into what was the beginning of an entirely new ore structure.

In 1953 the Jaquays Mining Corporation secured a Defense Minerals Exploration Administration loan and drove a new adit on the western slope of the Regal Mountain 1,200 feet ahead of and almost at right angles to the main adit. Within 100 feet of the surface good ore was encountered and this proved to be part of the ore body being mined from the main adit. The full size of this ore body has not been fully explored, but at the present time is some 400 feet wide by 800 feet long and has produced over $1.-500,000.00 worth of fiber since 1953. All development drifts along the trend of the mineralization are still in good ore. Effort is being made to maintain two years of developed ore ahead of mining at all times.

Mining at the Regal is carried on by a combination of modified room and pillar method, and long wall stoping and back filling. Pillars are left along the sides of the drifts and near loading chutes, where roof conditions are bad. Areas as big as 150 feet square have been stoped without leaving a single pillar.

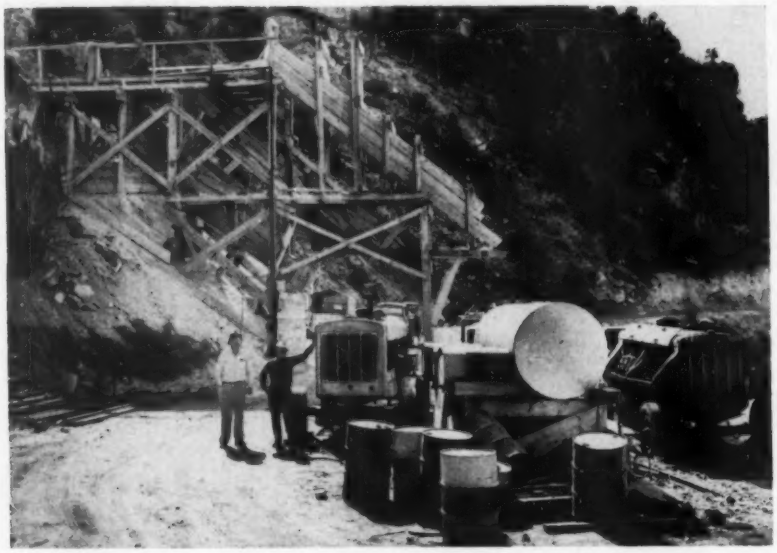
Asbestos mining is a selective mining operation, combined with sorting in stopes and hand cobbing at ore pockets. Bands of asbestos totaling only 1½ to 2 inches of fiber may be mined profitably in a 7-foot-high heading if at least half of the fiber is No. 2 grade or better. As the ore zones are narrow, approximately 50 tons of rock are mined to one ton of recovered fiber. Stope drifts 10 to 12 feet wide are first driven in the ore along the fringe of the block to be removed. In these stope drifts the ore is mined selectively as in regular stoping operations. As the ore occurs in two serpentine bands about 4 feet apart, one or two drill rounds of the waste between the ore bands is blasted and the waste removed. The asbestos-bearing serpentine bands are then shot lightly and the broken materials hand sorted. The tenor of ore in the two zones usually differs; therefore, blasting the upper and lower bands in separate operations allows the better ore to be sorted without excess dilution.

After the stope drift has been driven, the mining operation continues much the same as the drifting operations except that as much waste as possible is used as backfill. Ten Gardner-Denver air slushers are used in back filling, for removing excess waste, and for pulling skid-mounted, ¾-ton cars of sorted ore to chutes or loading stations. Blast holes are placed in the waste so that the heavily loaded shots will drive the rock against the backfill packing it to the roof. Over a period of time, the strong limestone back will sag and rest on the backfill. This gradual sagging is observed by noting the squeezing of stulls placed at intervals along the periphery of the stopes.

When folding or faulting causes the ore horizon to rise above the level of the adit, raises are used to transfer the ore and waste from the stopes above.

Exploration is carried on by advancing a drift located 20 feet below the main level. The muck from these drifts is removed by portable ramp loaders on which are mounted Gardner-Denver slushers. Four of these loader-ramps are often in use at one time. Drifting on this exploration level can be carried on without interferring with ore production. Drill holes 20 to 25 feet deep are drilled upward at intervals to check the ore in the ore horizon. Gardner-Denver 200 series sectional steel is used in a Gardner-Denver FL58 for these test holes. Where longer test holes are needed, a Gardner-Denver SF93, automatic drifter using 400 series 1-inch sectional steel in 4-foot changes is used to drill long holes as deep as 120 feet. An average of 2,000 feet of new

HAND SORTING AND COBBING are especially important to maintain a high-grade mill feed. Annual stoping produces 18,000 tons of ore which is carefully cobbed as shown above to produce 2,400 tons of mill feed.



AUTHORS POSE AT PORTAL: D. W. Jaquays (left) and F. H. Padgett. Mr. Jaquays, president of the Jaquays Mining Corporation, has been mining in the area since 1950. Mr. Padgett is mine superintendent.

development and haulage drifts are driven each year.

Annual stoping averages 36,000 square feet of ore or 18,000 tons to produce 2,400 tons of cobbed mill ore. From this mill ore 600 tons of fiber of all grades is recovered.

Equipment Used

Until 1953 all ore and waste in the mine was moved by hand shoveling. Today over 90 percent of all rock moved is done by mechanical means. Twenty men, today, stope three to four times as much area as the same number of men did three years ago and, in addition, drive haulage drifts, development drifts, and numerous transfer raises.

In order to accomplish this amount of work and to maintain high production, good equipment requiring minimum upkeep has been an important factor. Two, 500-cubic-foot, Gardner-Denver portable compressors are required during most of the working shift.

A third compressor, a 600-cubic-foot unit, is kept in readiness at all times as a standby and for any additional surface drilling. After considerable experimentation, the Gardner-Denver FL 58 feedleg jackhammer was selected to do the drilling. Five FL 58's are used and repair costs have been exceptionally low even though 200 to 300 feet of drilling per machine is done each day.

In the stopes three HEE and three HKE Gardner-Denver double-drum air slushers are used to drag waste into the backfill and for moving ore to loading points. Waste from development drifts is removed by four HEE Gardner-Denver slushers mounted on portable loading ramps.

Milling at Globe

Cobbed ore which contains 25 to 40 percent fiber is transported by truck to the company owned mill in Globe. This mill has a capacity of about 1½ tons of cobbed ore per hour and operates 8 hours per day. One shift per day is sufficient for an efficient and balanced operation of both mine and mill.

The milling of asbestos ore is essentially a process of crushing and screening. The rock crushes easily and will pass through a screen with square openings, whereas the asbestos material crushes into elongated bundles of fibers which pass over the screen. Thus a separation is accomplished. Rock containing shorter fibers requires additional crushing with subsequent separation using finer mesh screens.

DIAMOND DRILLING from main haulage level to prospect the favorable asbestos horizon 22 feet higher.

The fiber products recovered from only a crushing and screening operation are known as crude fiber and are graded according to length: e.g.

Crude Grade	*Length of Fiber*
No. 1	¾ inch or longer
No. 2	⅜ to ¾ inch
No. 3	5/16 to ⅜ inch
No. 4	less than ⅛ inch

Fiber which is too short to be recovered as a clean crude product is fiberized or opened up into a fluffy form by the use of a hammer mill. The serpentine or rocky portion of the feed to the hammer mill is pulverized and is separated from the fiberized asbestos by fine mesh shaking screens. The fiberized material is air lifted from the screens and transferred as a finished product to a bagging room.

The fineness of the final fiberized product can be controlled by fineness of feed to the hammer mill or by adjusting the retention period in the mill. These adjustments are made in order to furnish the particular grade desired by the various customers.

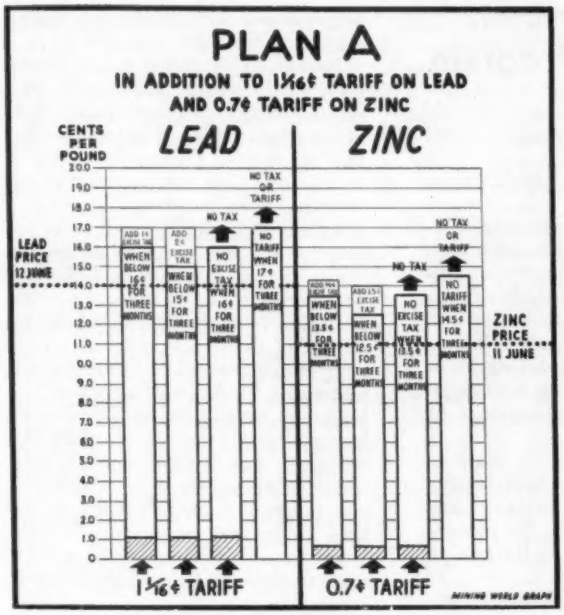
Quality of Fiber

The value of the fiber is not dependent on length alone; quality is a very important point. A premium over market prices may be obtained for very soft fiber of good tensile strength. Although all known deposits of asbestos in Arizona are of the chrysotile variety, there is much difference in the quality of the fiber in the individual mines—even a difference in quality of fibers in the same mine and in the same serpentine zone.

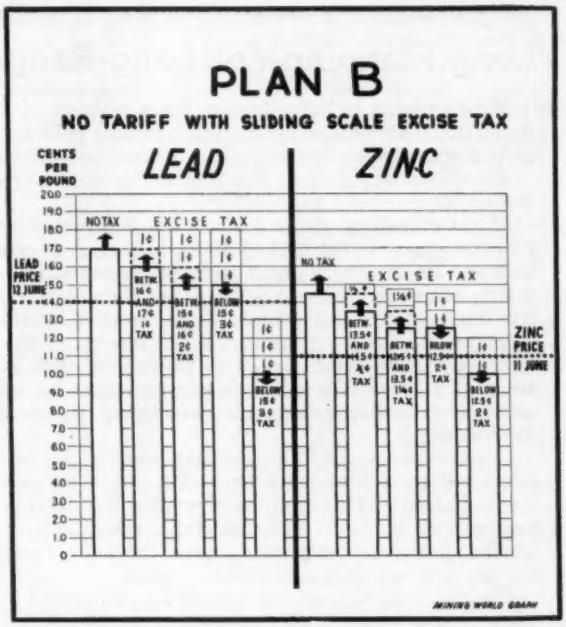
There are two distinct types of chrysotile fiber dependent on the quality of softness and harshness. Soft fiber feels smooth and can be twisted and bent between the fingers; the individual fibers usually are extremely flexible and strong. Harsh fiber has poor tensile strength; when a small bundle of it is twisted a few times it will break. Harsh fiber is splintery, prickly, and somewhat brittle.

Most of the asbestos produced from the Regal mine has been of a soft and semi-soft quality which exhibits high tensile strength. This fiber is very white and is purchased for use by the spinning, winery, brewery, edible oils, electrical, and chemical industries.

THE END.



IMPORT CONTROLS proposed for lead and zinc would be based on a 3-month average metal price. Plan A incorporates existing tariffs plus an excise tax. Plan B, which is favored by



Interior, would suspend the existing tariffs and impose a sliding scale import tax. Help was proposed for chromite, beryl and columbite-tantalite.

Here's the Long-Range Minerals Program of Interior Department

The Interior Department recommends that either of the following proposals be adopted for lead and zinc:

Alternate A: 1. In addition to the existing tariffs, if the average price for three calendar months shall fall below 16¢, an excise tax of 1¢ per pound on lead; if the average price for a three-month period on imports of zinc shall fall below 13.5¢, an excise tax of ¾¢ per pound on zinc.

2. If the price on lead is below 15¢, an additional 1¢; if the price on zinc is below 12.5¢, an additional ¾¢.

3. The excise tax on both lead and zinc shall be suspended when average prices on lead and zinc for a three-month period shall again be 16¢ for lead and 13.5¢ for zinc.

4. If the average three-month price for lead reaches 17¢ or for zinc 14.5¢, then the existing tariff shall be removed. See details in graph above left.

Alternate B: A sliding scale import excise tax on lead and zinc by eliminating the tariff and substituting:

1. **Lead:** If the average price is for a three-month period 17¢ or above—suspend excise tax. From 16 to 17¢—excise tax 1¢ in effect. From 15 to 16¢—excise tax 2¢. When below 15¢—excise tax 3¢.

2. **Zinc:** If the average price of zinc for a three-month period is 14½¢ or above—suspend excise tax. From 13½ to 14½¢—excise tax ½¢. From 12½ to 13½¢—excise tax 1¼¢. When below 12.5¢—excise tax 2¢.

All Mineral Commodities

A. Continued and intensified research and technical assistance by the U.S. Bureau of Mines and the United States Geological Survey. Such assistance must be expanded to keep pace with the rapidly increasing requirements for raw minerals materials, which will accelerate depletion of our own resources and increase our reliance upon foreign sources unless our technology constantly improves.

B. Continued assistance to private industry to stimulate exploration. This is a continuation of the Defense Minerals Exploration Administration program. It has been successful in that many small operators are participating, and the government participation, normally 50 or 75 percent of costs, is repaid through a royalty of 5 percent, if there is a discovery. The DMEA program would be oriented to long range needs.

C. A continuous review of the tax laws as they affect the mining industry should be maintained. No revisions in these laws are recommended at this time.

Special Assistance

The Department will continue its support of the program under Public Law 733 (84th Congress) until the new programs proposed, as follows, are in effect.

A. Beryl, columbium-tantalum, and chromite should be assisted by production bonuses as follows:

Long Planning For Long-Range Program

While mining industry leaders for a number of years have strongly urged that a long-range United States mining policy be adopted, it wasn't until August 14, 1955 that official action was undertaken.

On that date, President Eisenhower, in vetoing HR 6373 which dealt with seven minerals, announced:

"I am conscious of the desirability of developing a long-range minerals program for the United States to assure an adequate mobilization base and to preserve a sound minerals economy. The Advisory Committee on Minerals Policy so advised and the office of Minerals Mobilization has been established in the Department of Interior to determine and recommend such a program. . . . The interest of the domestic minerals industry will be better served by proceeding with the careful development of a long-range minerals program than by approving a stopgap measure extending substantial government aid to only a segment of the industry."

Interior Department officials have worked long and hard on the program and have repeatedly pledged that the program was being expedited. Industry observers are sure that the Interior Department was handicapped by other governmental agencies in formulating its recommendation for the program. Notably the State Department, Bureau of the Budget, and Commerce Department.

Chairman Murray of the Senate Interior and Insular Affairs Committee began hearings on the program on June 4th. Extensive hearings are scheduled on the program. There is no apparent chance for Congressional passage this year because of the economy drive. Indications point to a much more detailed bill being drafted for presentation to Congress in 1958.

1. **Beryl:** $70.00 per short ton (10 percent BeO) for domestically produced beryl concentrates. No limit on quantities supplied by individual producers. This program, contemplated to stimulate production at the prevailing rate of 500 short tons per year, to go into effect July 1, 1962 (termination of Defense Production Act).

2. **Chromite:** $21.00 per long dry ton (46 percent basis) for domestically produced commercial grade, metallurgical; 10,000 long dry tons annual limit from any one producer from any one mining district. Designed to stabilize production at present level of 34,000 per year, and permit an increase to 50,000 per year, the program for chromite would go into effect on July 1, 1959 (termination of D.P.A. program).

3. **Columbium-tantalum:** $2.35 per pound (combined contained pentoxides) for domestically produced concentrates; 10,000 pounds annual limitation on quantity from any one producer from any one mining district. Upon inauguration of this program, contemplated to stimulate production to 16,000 pounds annually, and permit an increase to 25,000 pounds, the P.L. 733 program would terminate.

B. **Asbestos:** the production of low-iron, long fiber, chrysotile asbestos from the San Carlos and Fort Apache Indian Reservations, Arizona, has been supported by government purchase programs since 1952. To realize the commercial possibilities of this unique resource by establishment of a mill to produce asbestos for the west coast market, the Department of the Interior, as a part of its Indian industrialization program, is exploring the possibilities of providing a loan to the Indians to assist in establishing a mill. It is contemplated that markets for the product would be developed through prvate enterprise and that the loan would be repaid out of operations.

What About Other Metals?

In an appearance before the Senate Interior and Insular Affairs Committee on June 4th, Secretary Seaton had the following comments to make about other minerals and metals.

Antimony: "Two major considerations lead the Department to conclude that no special program is justified . . . 1. Requirements for primary antimony are decreasing . . . 2. The nation's resource base in antimony, on the basis of the best available information, is insufficient to support a sustained high level of output of this commodity."

Barite: "No special program beyond that of the U. S. Bureau of Mines, which is directed towards the development of improved methods of separation of barite from complex ores, is necessary at this time."

Bauxite: "Domestic production of bauxite has increased steadily since 1948. Consumption is at record rates; it is still growing. Consequently, there is no present necessity for any special assistance for this commodity."

Boron: "This industry has shown such steady growth and there is such promise of an increasingly broad range of applications for this commodity, that no special government action is indicated beyond the limited research programs now underway."

Cobalt: "Cobalt does not meet the criteria for commodities requiring special programs. Domestic resources are not abundant, and there is little promise, aside from that presented by research, of the development of a fully competitive domestic industry for this material in the foreseeable future. The long-term outlook is for significantly increased world supplies of cobalt. We anticipate that this will result in substantial decreases in price. No reasonable program of support could, on the basis of present technology, provide assurance of development of a commercial domestic industry in the near future."

Copper: "Copper has not been included in view of the continuing good price and the fact that a two cents excise tax comes into effect when the price falls below 24 cents. The current rate of domestic production is expanding, and the market situation is stable at current conditions."

Fluorspar: (Acid-grade) "The Public Law 733 program, if continued as we have urged, will enable the industry to ride out the period of temporary surpluses and provide time for consumption to catch up with supply, and for the industry to orient its operations to normal commercial markets." (Metallurgical-Grade) "Government buying for the defense stockpile is providing a floor under the domestic price. It is expected that with the continuance of the stockpile purchase program for a while longer, the industry will be reoriented at reasonable price and production levels."

Iron Ore: "Iron ore presents one of the most serious problems within the minerals area. The enormous demands of two world wars and the recent period of emergency, together with the requirements placed on this industry by the sustained growth of the economy, have depleted a major portion of our high-grade iron ore reserves. Steel producers and merchant producers of iron ore have done an outstanding job in utilization of low-grade domestic resources. This has largely solved the immediate problems confronting this industry. At the present time there is no requirement for any special government program for iron ore."

Magnesium: "Production of magnesium in the past has expanded in time of war and receded just as rapidly

once the emergency has passed. The domestic industry is currently operating at approximately 68,000 tons per year, most of this from a single firm. There are no particular problems with respect to this commodity which are amenable to treatment through special governmental programs in peacetime."

Manganese: "The nation's resources of manganese are for the most part low-grade and complex. The basic solution to the domestic manganese problem lies in research to advance the technology of this commodity. The existence of a special Defense Production Act purchase program which will continue into 1960 makes unnecessary the provision for any further programs of special assistance at this time. Approximately one million dollars a year is being spent by the U.S. Bureau of Mines on research directed towards improved beneficiation methods."

Mercury: "Since 1952 the market price for this commodity has been sufficiently high to cause domestic production to more than double in volume. At the present time, and through 1958, a Defense Production Act purchase will provide a floor of $225 per flask. At this time there is no requirement for an additional government program."

Mica: (Strategic) "The long-range problem in strategic grades of mica can best be solved by emphasis upon research leading to synthesis of mica, and development of mica substitutes."

Molybdenum: "The domestic industry is now producing this commodity at full capacity to supply an expanding domestic market, an expanding export market, and the stockpile. The bulk of domestic production is from a single producer. Most of the remainder is produced as a byproduct from other mining operations. The increased level of production of this commodity, together with the health and vigor of its industry, indicates that there is no requirement for any special government program."

Nickel: "Prior to 1953 domestic mine production of nickel was negligible. Currently the United States is producing about 4,500 short tons of this commodity, some three percent of our requirements. This production is under government contracts. The long-term outlook for nickel is for continued dependence upon Canadian and Cuban sources of production. In all probability there will eventually be established on a sound commercial footing a small production in the United States, probably not greatly in excess of that currently prevailing."

Phosphate Rock: "Production has increased by approximately 50 percent from 1949 levels, and it is estimated that there will be further increases in production as utilization of fertilizers expands."

Potash: "It is anticipated that consumption will continue to increase as fertilizer use becomes more widespread. Imports are a minor factor. There is no requirement for any special government program beyond that now conducted by the United States Geological Suvey directed towards expanding knowledge of United States reserves of this commodity."

Sulphur: "Steadily expanding domestic and export markets for this commodity, in conjunction with the health and vigor of the producing industry, make unnecessary the provision of any special government assistance beyond the U.S. Bureau of Mines research on processes for the development of economical supplies of sulphur from presently marginal or submarginal sources."

Tin: "Production of primary tin in the United States is negligible. There is no requirement for a special program of assistance for tin in this country, because we have no known commercial deposits and have never developed a producing industry."

Tungten: "The Department of the Interior has supported and will continue to support the tungsten purchase provisions of Public Law 733. We feel that it is right and proper that the domestic industry be enabled to amortize investments made at the urgent request of the government during the Korean conflict, and be given an opportunity to reorient their operations to the market. Continuation of Public Law 733 is the best method of assuring these objectives. We believe that if the industry operates under this program until December 1958, the production then existing, coupled with new and reasonably anticipated demands from industry, will provide a more realistic basis from which to evaluate the position of the industry in our over-all economy.

This program represents the administration's judgment on what should properly be done now to maintain the vigor of the country's minerals industries. Such a program, of course, cannot be rigid and fixed and permanent. It is intended to be a sensitive and sensible response to certain economic facts; and such facts, in a dynamic and expanding economy, constantly change. For this reason the program would demand continual scrutiny and review. Such review would assure that the program would be as sound for the needs of tomorrow as we believe it is for the needs of today."

Use SAFETY YELLOW NYPRENE

FLEXIPIPE®

the new mine ventilation tubing by BEMIS

SAFETY YELLOW reflects the light . . . it is readily visible in darkness . . . minimizes damage from punctures by machinery and equipment.

And look at these additional important values you get in Bemis Nyprene FLEXIPIPE . . .

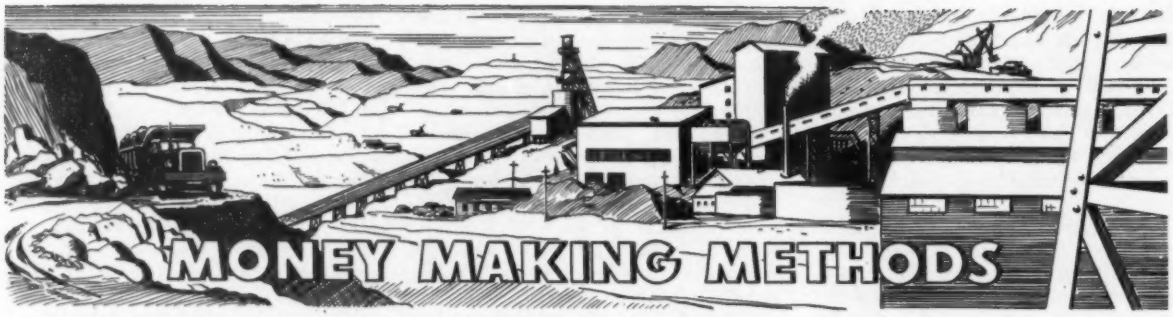
- Featherweight—fast, easy handling saves labor costs.
- Resistant to acid mine water, oil, grease, abrasion.
- Mildew proof—will not rot even if stored wet.
- Stores compactly—requires small warehouse space.
- Tremendous tear and tensile strength.
- Long life at low cost, with minimum maintenance.

Bemis also offers you Jute-grade FLEXIPIPE and Heavy-duty FLEXIPIPE. All three grades available with Bemis Rope Seam Suspension *at no extra cost.*

Write or wire for full information about Bemis FLEXIPIPE

Bemis BEMIS BAG CO.

111 N. Fourth St., Box 23
St. Louis 2, Mo.



Chrome Plated Inner Tubes Increase Core Recovery and Footage Per Shift

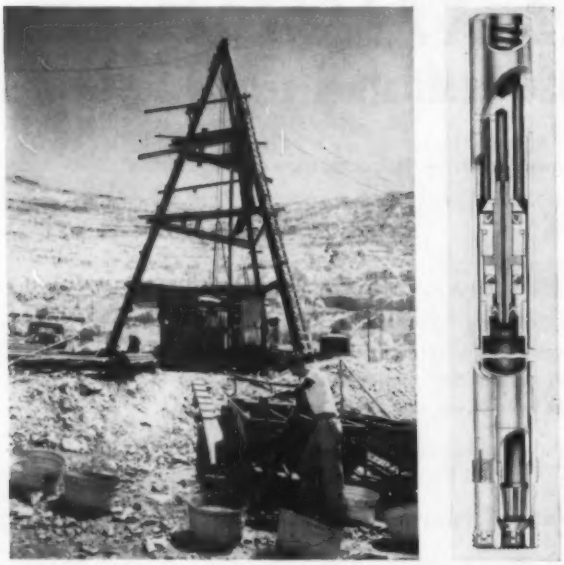
Diamond drillers are now using chrome plated inner tubes for core barrels to increase core recovery, speed drill footage per shift, and lower drilling cost.

For years, diamond drill operators and mining companies alike have looked upon hard, broken, abrasive rock with fearsome respect. This type of rock has meant poor core recovery for mining companies, resulting in a lack of vital information.

Now, however, with the application of chrome-plating to the inside wall of the inner tube, these problems are greatly alleviated. When chromeplated, the surface of the inner tube becomes harder than the material being drilled.

Most rock with a high percentage of silica has a greater hardness than that of a piece of seamless steel tubing. The surface of any piece of steel tubing is somewhat rough unless it is honed. These slight irregularities permit a broken fragment of core to wedge and allow the other core to dig in which causes blocking and heavy wear on the surface of the tube. While this core block remains in the tube, any core cut by further drilling at this point is ground and lost.

The application of chrome plating results in a very hard, smooth, abrasive-resistant surface for the inner tube. This surface allows the core to enter freely and reduces to a minimum the tendency of the core to block. Consequently, longer runs are obtained and a marked increase in core recovery is noted.



CHROME-PLATED inner tube (see cut-away at right) is harder than seamless steel tubing, reduces tendency of broken fragments to wedge in wall thereby blocking the barrel.

The following report indicates the advantages of using chrome plated inner tubes at a large western copper mine where badly broken quartzite, porphyry, and limestone were drilled. Two Christensen Diamond Products Company five-foot, chrome-plated, inner tubes were used to drill a total of 635 feet in 189 individual runs. A breakdown of the length of runs is as follows:

No. of Runs	*Length of Runs*	*Percentage of Total Runs*
20	1 foot	10.6
38	2 feet	20.1
49	3 feet	25.9
17	4 feet	9.0
65	5 feet	34.4
189		100.0

Average length of run was 3.36 feet.

One five-foot standard inner tube was used to drill a total of 48 feet in 20 individual runs. A breakdown of the length of runs is as follows:

No. of Runs	*Length of Runs*	*Percentage of Total Runs*
6	1 foot	30
7	2 feet	35
2	3 feet	10
3	4 feet	15
2	5 feet	10
20		100

Average length of run was 2.4 feet.

Standard five-foot inner tube costs $20.00, as compared with $36.00 for a chrome-plated, five-foot, inner tube.

It was estimated by the foreman on the job that standard inner tubes are retired from use after approximately 100 feet of use. When retired, they are badly worn and dented out of round, because of the pounding with wooden clubs necessary to remove the core.

The first chrome plated tube was used for approximately 185 feet before it was re-machined by Christensen Diamond Products Company and turned end for end. This was done because the chrome had started to peel at the bit end causing core blocking and consequent short runs. After the change, it was used for an additional 150 feet, then retired. Total footage cored with this barrel was 335 feet. Because chrome plated inner tubes are made from heavier tubing, denting by the wooden clubs was virtually eliminated.

The second chrome plated inner tube, in use at the time of this report, has been used for 300 feet.

This and other performance reports from the field clearly indicate some of the advantages of chrome plating the inside of inner barrels to be: (1) longer runs—greater footage per shift, (2) increased core recovery, (3) longer inner tube life, (4) faster drilling, and (5) less disturbance of core.

1957 MINING AWARD....

WINNER....*Koehring high-lift stripping shovel*

1957

BLUE RIBBON
MINING AWARD

To KOEHRING DIVISION
of
KOEHRING COMPANY

for achievement in equipment development aiding the technological advancement of the mining industry.

AWARDED BY
MINING WORLD/WORLD MINING
MILLER FREEMAN PUBLICATIONS

PROGRESS THROUGH BETTER TECHNOLOGY

In an annual review of new equipment developments for the mining industry, *Mining World* and *World Mining* magazines appoint a panel of judges from leading mining and contracting firms to pick blue ribbon winners. This year's selections have just been announced from a broad field of over 200 equipment entries. In the open-pit category a top award goes to Koehring Company for its new 1205 high-lift stripper. Here is a brief review of the blue ribbon winner. Shovel capacity: 3-yard dipper on 40-foot high-lift boom . . . 2½-yard dipper on 50-foot high-lift boom. Dragline or clamshell capacity: 3 to 4-yard bucket on 60 to 170-foot boom. Crane lifting capacity: 95 tons (based on 75% rating). This is the kind of equipment that helps the mining industry meet today's challenge of more production at lower cost.

KOEHRING DIVISION OF KOEHRING CO.
Milwaukee 16, Wisconsin

K7013

HERE'S AN AERIAL VIEW of the Hannover Industrial Fairground where over 40,000 cars were parked each day. There were approximately 4,000 exhibitors, from over 17 countries. Exhibits ranged from mucking machines to radios.

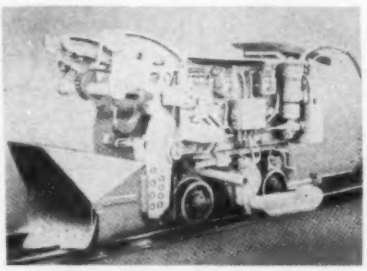
German Industries Fair Features World-Wide Machinery Exhibits

One of the world's largest and most outstanding international trade fairs was held recently in Hannover, West Germany. During the period from April 28 to May 7th, over 4,000 exhibitors from 17 countries throughout the world, including the American firms of Caterpillar Tractor Co., Eimco Corp., and International Harvester Co., displayed their latest industrial products.

The wide range of machinery exhibited covered many types of industries. Among them the first showing of the nuclear equipment used in the British Atomic Industry, as well as several new innovations in the field of mining equipment. Some idea of the size of the fair may be obtained from the fact that there were over 380,000 square yards of exhibit space used, and that the fair's parking lot, accommodating over 40,000 vehicles, was filled to capacity every day.

On hand to bring you up-to-date information on the latest European mining equipment displayed, Mining World's special European representative spent several days at the fair, studying the latest trends in European mining machinery.

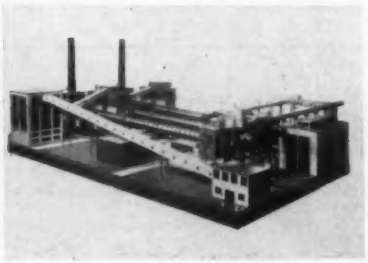
One of the more novel and interesting mining exhibits at the fair was a display on the Krupp Renn-Kiln plant. This plant uses the Renn process which is a direct reduction process intended to produce iron in the form of low-carbon nodules. The following page will have several descriptions of items exhibited at the fair, and further information may be obtained by circling the appropriate number on the reader inquiry card.



Electric Mucking Machine Featured At Hannover Fair

The Salzgitter Company of West Germany displayed their electric mucking machine, which they say lowers the cost

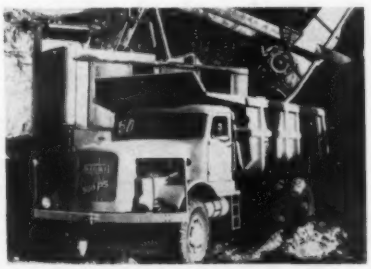
of power used to about one-fifth that of similar air powered machines. According to the company the explosion-proof electric motors, have considerably higher starting torque than compressed air engines, thus increasing attach impact and throwing distance. Circle No. 47.



Direct Reduction of Iron Ore by Krupp Renn Process

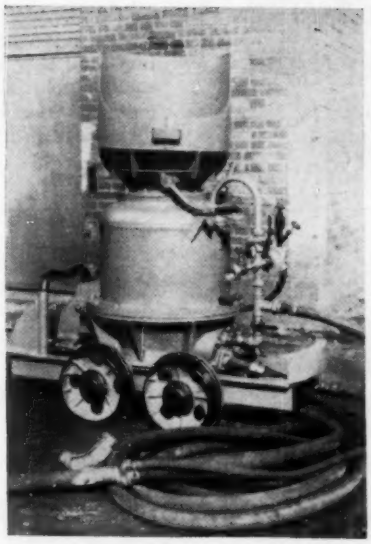
The above photograph features a Krupp-Renn Kiln plant. The Krupp-Renn process, carried out in a cylindrical rotary kiln, is a direct-reduction method to produce iron in the form of small, low-carbon nodules called "Luppen." High silica ores, and fine ores may be treated directly, without previous concentration or sintering. The quality of fuel required is less exacting than in conventional processes, and resistance and abrasion of fuel offers no problem as the fuel is mixed with the ore in a fine grained condition. This method is independent of the availability of large size metallurgical coke.

The material passes through the kiln countercurrent to the reducing gases, while preheating is done by exit gases. The reduction of metallic oxides to metallic sponge, forms the "Luppen" which are discharged from the kiln together with the pasty slag. The formation of "Luppen" is a definite advantage in this process, as sponge iron may be produced by other processes, but the impure slag is so intermixed with the metallic iron that no method of magnetic separation can remove the slag from the iron on cooling. The "Luppen" however, can be easily separated by magnetic separation and a recovery of over 94% iron can be made from the mixture of iron and slag. Circle No. 48.



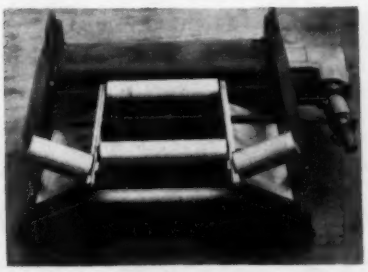
Kaelble Produces 30-Ton Off-Highway "Tipper"

The new "Tipper" or off-highway truck, has recently been developed by the Carl Kaelble Co. of West Germany. The three-axle unit features a 200 hp Diesel engine, and is designed to haul a 30-ton payload. For further information circle No. 50.



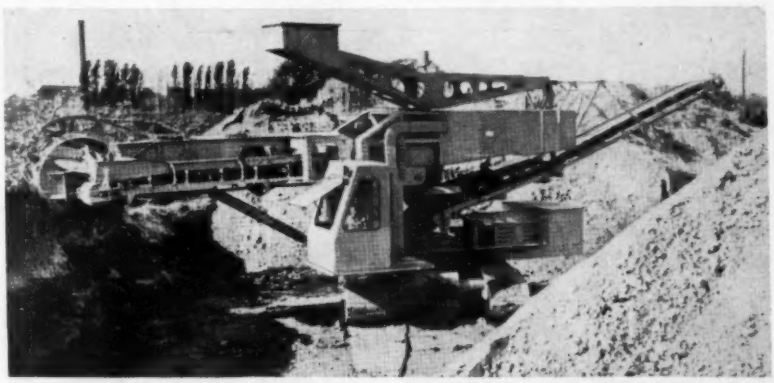
New Concrete Gun For Underground Guniting

The Torkret Company of West Germany has developed a new concrete gun adapted for underground mining. The machine is fitted on mine car wheels, and may be used either for gunite work or grouting. Handling over three cubic yards of bulk material per hour, the unit consumes approximately 216 cfm of air. Maximum grain size of concrete sand the machine will handle is 15 mm. The Torkret Concrete gun may also be fitted with wheels having solid tires, for off-rail use. Circle No. 49.



Air Operated Head Pulley Featured by German Firm

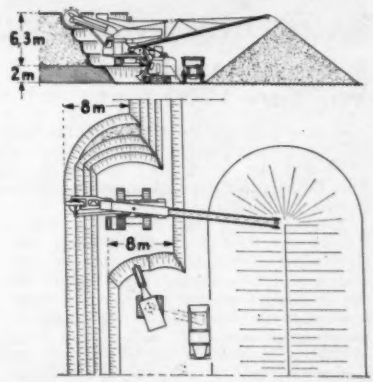
The Heinrich Scharf Company, of Hamm, Germany, have developed a Pneumatically operated head pulley for use in underground conveying systems. Various sizes and horsepower ranges are available. Circle No. 46.



Continuous Excavation by Bucket Wheel Excavator

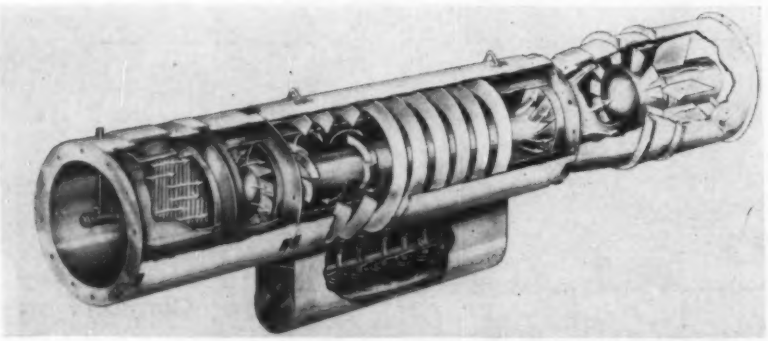
The Orenstein-Koppel organization of West Germany have developed a Bucket Wheel Excavator for stripping and open pit mining. The machine features a bucket-wheel at the end of a conveyor arm, which digs into a bank and transfers the muck on to the conveyor arm. This material is transferred on to another conveyor boom for continuous discharge into trucks, railroad cars, or stockpile dumps.

A series of knives break up the ground ahead of the conveyor buckets on the wheel for ease in digging. A rotating, circular feeding plate then transfers this muck to the conveyor belt. The conveyor belt rides on three-pulley idler sets, set at 30 degrees. A system of spirals on the underside of the belt keeps it scraped clean at all times. The entire unit is mounted on a floating crawler-type undercarriage, and is powered by either Diesel engines or electric motors with trailing cables. Circle No. 45.



PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD'S way of making available to you some of the finest current information on mechanization.



"Microdyne" Offers Efficient Dust Collection

The Joy Manufacturing Company, 532 Oliver Bldg., Pittsburgh 22, Pa., have recently introduced the Joy "Microdyne" Dust Collector. According to the company, the Joy "Microdyne" has an efficiency of 99-plus per cent in collecting dust particles of five microns or greater. Its compact size suits the unit well for underground operation.

Contaminated air enters the dust collector through the units mixing section which contains a water spray and impingement element. The central part of the unit is a water elimination section which is an axial type cyclone with turning and straightening vanes. The third section of the "Microdyne" unit is a transition area, containing the Joy axial flow fan.

New Heavy Duty Drill Will Core 1500 Feet

A new heavy duty rotary drill which will be used for core drilling to depths of 1500 feet has been built by the Reich Bros. Manufacturing Company, Terre Haute, Indiana.

The machine, Model C-675, has a weight in excess of 100,000 pounds with all drilling equipment. The first production model was shipped to England for use in British mining areas. An unusual feature of the machine is the air-conditioned enclosure built around the body of the rig to provide for all-weather operation as well as ease of maintenance during bad weather.

The Reich Rotart Model C-675 has a 50-foot stroke. It is track mounted for use in more difficult terrain.

As an exploration tool the Model C-675 is designed to locate deposits at depths where surface core drilling is considered difficult. For additional information circle No. 52.

Autocar Has 600-HP 40-Ton Off-Highway Truck

Autocar Division of the White Motor Company has announced a new 40-ton truck, designated the AP-40. This is the third in the AP line to be introduced by Autocar since late last year. The first two, also rear dumpers, were the AP-15 and the AP-25. The AP-40 is the first truck having more than 400 horsepower in a single engine.

The new truck is powered by a V-type, turbocharged, 12-cylinder Cummins Diesel—an engine previously used only in locomotives, and as a stationary power plant for oil-field operations.

The AP-40 drives on all four wheels in the tandem rear. If either set of wheels loses traction, an air-powered lock applied on an interaxel differential by the driver from the cab, blocks out torque loss, permitting the other axle to continue driving. Many other features of the AP-40 are listed in available literature. Circle No. 44.

Orzan AL-50 Controls Dust on Dirt Roads

Orzan Al-50, a new product developed by the Crown Zellerbach Corp, is finding increased use in open pit mines in minimizing dust on haulage road surfaces and other extensive unpaved areas. Essentially an ammonium lignin sulfonate derived from wood pulping, Orzan when sprinkled on a dirt surface, gradually hardens the surface by binding the dirt and gravel together. According to the company, in one open pit mine, one sprinkling was enough to withhold dust for three weeks, whereas when sprinkling with water alone, dust reappeared as soon as the road dried out. The chemical may be shipped either in bags, or in drums or tank cars containing a 50% solid solution. Circle No. 60 for additional information.

Resisto-Loy Hardsurfacing Increases Crusher Wear

New roll crusher shells have been hardsurfaced and offer the user large savings in maintenance costs. The life of gyratory liners, crusher rolls, and other equipment subject to severe abrasive use can be greatly extended and maintenance costs reduced materially by use of Resisto-Loy.

Worn parts can be rebuilt back to straight with Mangatone nickel-manganese filler rod through use of the Two-Tone welding process. The Two-Tone process, which deposits greater thicknesses of metal and more pounds per hour than any other method of welding, can easily prove the answer to your rebuilding problems. Both Resisto-Loy and Mangatone are available in the U. S. through the Resisto-Loy Co., Inc. and Robert Marr & Son, Inc., export representative for users outside the U. S. For interesting and informative literature on Resisto-Loy and Mangatone, circle No. 51.

CON-O-WEIGH is the name of a new continuous belt conveyor weighing system developed by the Industrial Physics and Electronics Company. This system, pneumatically operated, offers a new concept in industrial weighing which provides a high degree of accuracy for measuring practically any material on belt conveyors. Circle No. 1 for free catalog.

STONTITE SEALER: The Stonehard Co. have now available a six-page brochure describing the product "Stontite." According to the company, this sealer, when mixed with Portland cement, stops active water flow in cracks, even against hydrostatic pressure. Circle No. 5 for your copy.

METALLURGICAL BULLETIN: The Galigher Co. has available for you a new metallurgical bulletin describing the full scope of the company's metallurgical services which is available for your company. Send for your bulletin by circling No. 11.

ROK-BIT BROCHURE: Brunner & Lay, Inc. have recently published a new bulletin describing their line of carbide insert bits and steel for both large and small hole drilling. Receive your copy by circling No. 12.

AUTOMATIC PRECIPITATOR CONTROL: Western Precipitation Co. have recently developed a new automatic precipitator control to operate Cottrell Precipitators for collecting dust, fume, fly ash or other suspensions. Investigate this new unit, circle No. 14.

LAB EQUIPMENT: Sturtevant Mill Co. have now available a new brochure on their complete line of laboratory equipment, among which is Roll Jaw Crushers, Crushing Rolls, Sample Grinder and Swing-Sledge mills for pulverizing soft, hard, or tough fibrous materials. Circle No. 15.

SWEETLAND PRESSURE FILTER is the title of a new brochure being issued by Dorr-Oliver, Inc. The bulletin describes the design, materials of construction, operation and advantages of this highly adaptable batch pressure filter. For your copy of bulletin 7400 write: Dorr-Oliver, Inc., Barry Place, Stamford, Connecticut.

UNDERGROUND TRANSFORMER: Designed to require a minimum of maintenance, the Allis-Chalmers Manufacturing Co., Milwaukee 1, Wisconsin, have developed a fire and explosion-proof sealed dry-type transformer in the five-kv class and below. The unit is made of heavy plate construction to withstand the abuse of mining operations. Write to company for further information.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. No postage necessary if mailed in U. S.

UPPER 3 CARDS ENABLE YOU TO WRITE THE MANUFACTURER DIRECT FOR FAST SERVICE

Postage Required

Gentlemen: **URGENT!**

Please send me further information on your equipment as featured on page ..... in the ..... issue of MINING WORLD-WORLD MINING.

Product: .....

Product: .....

My Name: ..... **Title:** .....

Company: .....

Address: .....

MINING WORLD—WORLD MINING READER SERVICE

Gentlemen: **URGENT!**

Please send me further information on your equipment as featured on page ..... in the ..... issue of MINING WORLD-WORLD MINING.

Product: .....

Product: .....

My Name: ..... **Title:** .....

Company: .....

Address: .....

MINING WORLD—WORLD MINING READER SERVICE

Gentlemen: **URGENT!**

Please send me further information on your equipment as featured on page ..... in the ..... issue of MINING WORLD-WORLD MINING.

Product: .....

Product: .....

My Name: ..... **Title:** .....

Company: .....

Address: .....

MINING WORLD—WORLD MINING READER SERVICE

JULY 1957 **NOT GOOD IF MAILED AFTER AUGUST 25**

CIRCLE NUMBERS OF ITEMS YOU DESIRE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

Also send further free information on the equipment advertised on pages:

Pages .....; **Product** ..... **Manufacturer** .....

Pages .....; **Product** ..... **Manufacturer** .....

Company or firm name

To attention of *Address*

City *Zone* *State or Province* *Country*

IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business _____ (Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position _____ (Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

Use this section to subscribe only

Sign here if you wish to subscribe to MINING WORLD _____

☐ **3 years, $7** ☐ **2 years, $5** ☐ **1 year, $3** **(Add $1 per year if outside U.S., Canada, Latin America)**

UPPER 3 CARDS ENABLE YOU TO WRITE THE MANUFACTURER DIRECT FOR FAST SERVICE

Postage Required

To: _____

_____

_____

_____

Attn: Sales Promotion Dept.

Place Stamp Here

To: _____

_____

_____

_____

Attn: Sales Promotion Dept.

Place Stamp Here

To: _____

_____

_____

_____

Attn: Sales Promotion Dept.

Place Stamp Here

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMI No. 3430, Sec. 34.9, P. L. & R. San Francisco, Calif.

MINING WORLD—WORLD MINING
500 HOWARD STREET
SAN FRANCISCO 5,
CALIFORNIA
U. S. A.

DRILL STEEL PRICE LIST: Brunner & Lay Company have recently published a price list and catalog for their complete line of tungsten carbide chisel instraset drill steel. Quantity discounts are listed as well as their steel guarantee. For your copy circle No. 21.

ORE DRESSING CATALOG: The Denver Equipment Co., 1400 17th, Denver, Colorado, have now available a 20-page Mill and Plant Equipment Bulletin No. G3-B59, showing their latest models in crushing, grinding, screening, classifying, portable and materials-handling machinery. Other related equipment is also featured. Write the company for your copy.

THREE NEW BLOCKS: The Skookum Co., Inc., 8524 N. Crawford, Portland, Oregon, have developed three new slusher blocks for mining. Available with any type hanging device, these lightweight manganese steel blocks are designed to accommodate safe loads to 21,000 pounds, and are all equipped with Timken bearings. Write to the company for additional information.

HMS PLANTS: Southwestern Engineering Company, 4800 Sante Fe Ave., L.A. 58, California, have recently published a brochure dealing with the principles of HMS plants, and detailed descriptions of Sweco built plants. For your copy of this interesting catalog write direct to the company.

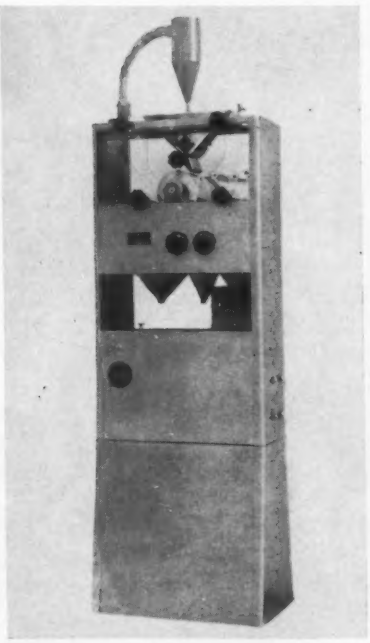
PAYHAULER BOOKLET: An eight-page, illustrated folder describing the two models of Payhauler, off-highway truck, now is available from International Harvester Company, Construction Equipment Division, 180 N. Michigan Ave., Chicago 1, Ill. The brochure gives complete specs and on-the-job photos of the 24-ton "95" and the 18-ton "65". Write for booklet CR-592-G.

HYDRACONE CRUSHER: Construction and design features of the "Hydracone" crusher which assure greater flexibility in obtaining desired tonnage, product analysis and product shape are described in a new bulletin released by Allis-Chalmers Mfg. Co. Milwaukee 1, Wisconsin. For your copy, write the company for bulletin 07B7145C.

SAFETY YELLOW: The Bemis Bro. Bag Co., 408 Pine St., St. Louis, Missouri, announces the incorporation of Safety Yellow in the manufacture of Nyprene Flexipipe. This new yellow-colored flexible mine vent tubing is designed to give distinct visibility underground, as well as to reduce danger of puncture by mine machinery. Write to the Bemis Co. for further information.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. NO postage necessary if mailed in U. S.

Sign here if you wish to subscribe to MINING WORLD
☐ 3 years, $7 ☐ 2 years, $5 ☐ 1 year, $3 (Add $1 per year if outside U.S., Canada, Latin America)

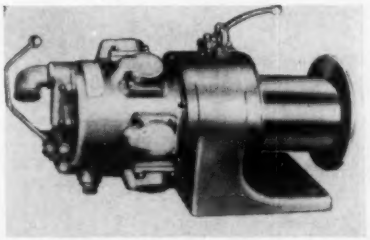


High Tension Separator For Lab and Pilot Plant

A new high tension separator for laboratory and pilot plant use, Model HP 167, has been announced by Carpco Manufacturing, Inc., Box 3272, Jacksonville 6, Florida. Separation of fairly small samples for research purposes or at feed rates up to 300 pounds per hour, is accomplished by means of a beam type electrode and a compact airlift for recirculating loads. For details, write company using attached post card.

Lightweight "Back-Pack" Resuscitator Announced

A lightweight life-saving device has been developed that will make it relatively easy for a rescuer to carry a "breath of life" on his back to a person who is unconscious or trapped. Developed by medical engineers of the National Gas Cylinder Company, the new unit weighs about 20 pounds with its two "D" oxygen cylinders. It is designed to be quickly fastened to the back and is held in place by elastic bands. Circle No. 57 for additional information.



Four New Hoists Added to Atlas Copco Line

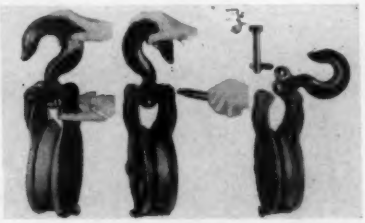
Introduction of a complete series of six-cylinder portable air utility hoists designed for better operator control of skidding and hoisting work in mining has been announced by Atlas Copco Pacific Inc. Four models with load capacities of 1,100 to 4,400 pounds at 85 psi, comprise the new series. Each is said to develop high horsepower in relation to its total weight; also, according to the company the design gives hoist operators a smoother more uniform control at all rope speeds. A single positive adjustment shifts the drum into free-wheeling, permitting substantially faster hook-ups. Circle No. 72 for additional information.

Autocar Develops New 40-ton, 600-hp Truck

A 600-horsepower Diesel rear dump truck for mining has been developed by Autocar. Fast, with speeds up to 33 miles per hour, and engineered for 40-ton payloads, the new dump truck, a tandem-rear vehicle, has new design features dictated by need for bigness and ruggedness of all components. Circle No. 59 for additional information.

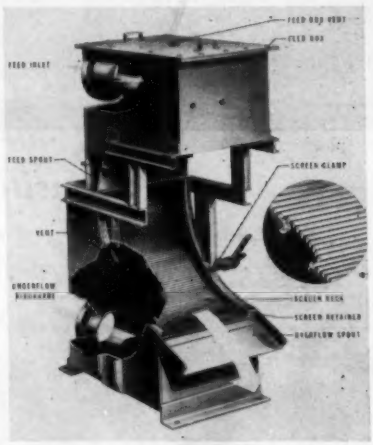
Mechanical Gold Pan Make Hand Panning Obsolete

Denver Equipment Co.'s new mechanical gold pan is gasoline-powered and skid-mounted. The unit may be hauled by trailer to river's edge and operated either in the trailer or out. As gravel is mucked from river botton into the machine, its oscillating motion enables it to handle over 20 cubic yards per day. The unit has coarse top screen where oversize gravel is washed and discharged, a fine screen and nugget trap, and two pans with matting for trapping heavy grains. An integral dredge pump supplies water for washing and permits the working of deep inaccessible pockets. For further information write to Denver Equipment Co., 1400 17th st., Denver, Colo.



New Lightweight Block is Practically Shatterproof

A new heavy-duty Rigger-Slusher block is now available from Sauerman Bros. Inc. This new addition to their line of Durolite blocks is light and according to the manufacturer, practically shatterproof. Made of high quality alloy steel, it will withstand 14-ton dead loads without damage. Wide flange permits use of up to and including ¾-inch wire rope. Circle No. 56 for additional information.



New Screen for High Capacity Separation

Dorr-Oliver Incorporated, Barry Place, Stamford, Conn., announces the availability of the Dorr-Oliver DSM Screen for the continuous wet screening of slurries containing non-fibrous solids. This new stationary screen is particularly adaptable to separations in the 8-to 48-mesh range, and to date has been successfully applied to classifications in the metallurgical and non-metallics industries. Because of unique principles of design both screen capacity and efficiency are far greater than those of vibrating screens. For more information write to the company using attached post card.

U. S. A.

This season do more BIG work

. . . with mining's best-proved torque converter tractors
. . . backed by 17 years of on-the-job experience
. . . thousands of profit-tested production models

More efficient dozing—Matched engine-converter-transmission team lets operator choose speed range for each job as he starts . . . finish most jobs without further clutching or shifting (except for reverse). With full control at throttle, he can work safely and efficiently regardless of terrain.

Faster on tough scraper jobs—These Allis-Chalmers tractors multiply torque up to four and a half times . . . develop maximum drawbar pull when it's needed most . . . start the load smoothly regardless of material in the cut . . . automatically accelerate to the highest speed that conditions permit.

Nothing like 'em on big loading jobs—The 3-yard HD-16G and 4-yard HD-21G tractor shovels are tough, mobile, flexible enough to pay big dividends on many projects. Operators can crowd surely and steadily . . . without stalling, shifting gears or losing control of the bucket because of slow engine speeds.

per man-hour . . . at lower cost

No construction equipment dealer in your area knows torque converter tractors as well as your Allis-Chalmers dealer. See him . . . and get the benefits of 17 years' experience working for you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Longer life for big equipment—Hydraulic torque converter cushioning reduces shock and vibration on the power train, the entire tractor and its auxiliary equipment—mounted or drawn. That means less downtime, more production time . . . better profit protection on any job!

ALLIS-CHALMERS

Engineering in Action

High altitudes, narrow benches severely test this Michigan, yet every day it loads

400 tons of rock weighing 5,400 lbs per cubic yard

Up in the scenic Sapphire Mountains of southwestern Montana, Cummings-Roberts Company has one of the toughest rock-loading jobs you could find anywhere.

Part of the time, they blast and load coarse mountain-top granite . . . summer and early fall, they load fluorspar. No one needs to detail what a severe test the heavy, rough granite overburden gives to *any* loader. Fluorspar, however, is even worse. A heavy rock mineral, it weighs 5,400 pounds per cubic yard—over 850 lbs more per yard than in-bank granite (and 2,200 lbs more than pit-run gravel).

Proved by demonstration

Over the years, Cummings-Roberts has tried just about every kind of loader made. Last year to increase efficiency, their Michigan distributor, Miller Machinery Co., Missoula, suggested a Model 175A Michigan Tractor Shovel. "Frankly," Cummings-Roberts officials told them, "we don't believe *any* rubber-tire unit can load the stuff, much less do the work day in and day out. But we'll give it a try."

Result? John Taber, General Superintendent, wouldn't let them take the Michigan off the job.

Heaped loading assures proper blending

Today, the 133 hp 2¾ yard Michigan handles *all* loading of the super-heavy fluorspar. Production, with trucks on 600 ft one-way hauls to crushing mill, averages 400 tons per 7-hour day. The fluorspar, incidentally, varies considerably in grade from place to place through-

out the mine. It must be blended to give the grade desired for shipment . . . and this assignment goes to the Michigan, too. Its 27 mph mobility is a vital asset on this scattered loading; trucks never wait more than a few minutes for loading service.

Strips granite overburden — 500 tons per day!

In late autumn and sometimes in spring, the Michigan strips the granite overburden. Output averages *500 tons* per 7-hour day.

Downtime negligible

With all this rugged loading of super-heavy material, plus repeated back-and-forth maneuvering on narrow benches, plus continuous work at high 6,800 to 7,000 ft altitudes, the torque converter equipped Michigan has posted an excellent mechanical record. *To date, it has had only one minor breakdown!*

Also tows compressors, speeds other odd jobs

Operator Don Lindblom likes Michigan's powershift transmission, says its bucket action is the best he's ever worked with. "You can tip it back and fill it easily," he says. "I like the fact also that it takes only half-an-hour per day to refuel and lubricate." Foreman Waino Lindblom adds, "The Michigan has done a nice job for us! We particularly like its truck-like speed in moving from bench to bench." This mobility gives the Michigan some "spare time" to handle maintenance jobs scattered along 15 mi of mountain roads—cleaning rock rubble off benches so trucks and wagon drills can get through . . . hauling air compressors . . . digging culverts . . . even plowing snow.

Got a tougher job than this?

There *may* be a tougher materials-handling job than loading granite and fluorspar . . . but we're willing to bet a Michigan Tractor Shovel can do it faster, better, at lower cost than any other machine. To prove it, your Michigan Distributor will be glad to arrange a demonstration at *your* convenience. *You pick the jobs.*

CLARK® EQUIPMENT

Michigan is a registered trade-mark of
CLARK EQUIPMENT COMPANY
Construction Machinery Division
2493 Pipestone Road
Benton Harbor 33, Michigan
In Canada: Canadian Clark, Ltd.
St. Thomas, Ontario

500′ (IN 30′ DEPTHS) PER 8-HOUR SHIFT in limestone, with 2 heavy-duty wagon drills and efficient Jaeger "600" air power. Drilling is done in 2 lifts, first to 20′, then a final 10′ lift. Lewisburg Limestone Co., Lewisburg, Tenn.

Jaeger 600 "far more efficient", *says quarry operator*

Powers 2 heavy-duty drills averaging 500′ per shift in limestone; engine speed under 1650 rpm

It takes plenty of constant 100-lb. air to power 2 heavy-duty wagon drills logging a fast 500′ in limestone, each 8-hour shift. This Jaeger "600" rotary does the job for Lewisburg limestone, with ample air reserve, at easy, fuel-saving speeds that never reach 1650 rpm. This economical, slow-running performance cuts fuel costs, saves wear and tear on engine and compressor. "Far more efficient than the compressor it replaced," reports Lewisburg Limestone.

A Jaeger Roto "600", using the same Model 6-71 GM diesel engine, produces the same 600 cfm of air as other "600" compressors at 100 to 150 rpm slower speed (1650 rpm instead of 1750 or 1800). You cut fuel costs, reduce fpm of engine piston travel and save up to 9000 revolutions every hour you operate a Jaeger "600". Smaller Roto Air-Plus® units (125, 250 and 365 cfm) have the same slow-speed, high-efficiency performance.

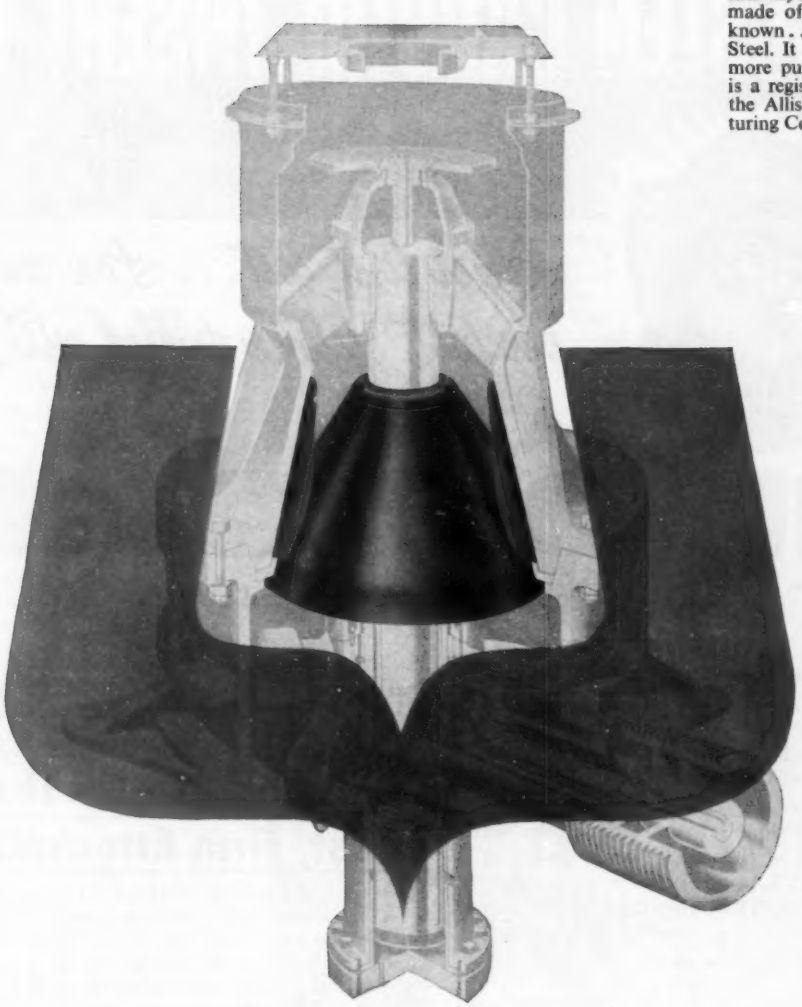
It will pay you to get full details and prices from your Jaeger distributor — or ask us to send Catalog JCR-5.

MAKING LITTLE ONES OF BIG ONES: Jaeger "125" rotary keeps this hand-held rock drill operating at full efficiency by producing 125 cfm of 100 psi air at only 1700 rpm, instead of the usual 1800. You save the difference, in fuel and wear.

THE JAEGER MACHINE COMPANY

667 Dublin Avenue, Columbus 16, Ohio

PUMPS • CONCRETE MIXERS • SPREADERS • FINISHERS • TRUCK MIXERS



Concave ring and mantle of this *Hydrocone* crusher are made of the toughest steel known . . . Amsco Manganese Steel. It *gives* a little, to take more punishment. *Hydrocone* is a registered trade-mark of the Allis-Chalmers Manufacturing Company.

How a little give adds a lot of life to AMSCO CRUSHER PARTS

Both mantle and concave ring crush a lot more feed because of certain properties of Amsco® Manganese Steel. The metal *gives* a little under crushing forces, absorbs stresses, resists cracking and chipping. Yet these same forces work-harden the surface of Amsco Manganese Steel to as much as 500 Brinell . . . a high hardness, stubborn to wear.

Amsco Manganese Steel Crusher Parts maintain their ductile undersurface and work-hardened surface even when worn thin. That's why Amsco parts endure severe abuse for so many work hours without letup.

To be sure of getting Amsco Manganese Steel, order replacement parts from your crusher manufacturer. Amsco makes manganese steel parts for most manufacturers of crushing, grinding and pulverizing equipment.

Amsco also produces other alloy steels with maximum wear resistance under particular service conditions

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS; JOLIETTE, QUEBEC

A TUNGSTEN CARBIDE INSERT BIT

"drilled to destruction without need of resharpening"

patents applied for

Lower first cost... Low cost per foot of hole drilled with

LIDDICOAT

the new bit you have heard and read about

Forged for Toughness

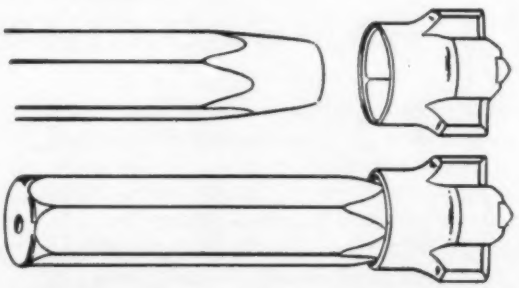
The Liddicoat Tee Cee bit body is produced entirely by forging. By a patented and exclusive manufacturing process, the hot alloy steel is subjected to tremendous pressure which extrudes the steel in the desired shape. This method preserves the important grain of the steel, flow lines being compressed rather than cut across as is usual in forgings of this type. The retention of the unbroken grain and the compression of the steel provides Liddicoat bits with an unusually strong tough body.

Longer Life from Interesting New Insert

In examining the Liddicoat Tee Cee bit, you will note the shallow tungsten carbide insert (patents applied for). It is the design of this insert that provides the unusual performance of the Tee Cee bit. Experience with the conventional multi-use insert bit indicates that the bit will usually dull at a given footage, the distance of course, depending on the type of rock. The dulling point of the multi-use carbide bit is not to be considered as the life of the Liddicoat single-use Tee Cee bit, for experience proves that the Liddicoat "used to destruction" Tee Cee bit drills far beyond the average dulling point of the multi-use Carbide bit.

Taper Socket—No Threads —Fast, Firm Attachment

The type TS Tee Cee Liddicoat (no resharpening) bit has a completely new taper socket connection. Within the socket of the bit is a brass shim. The socket, which is completely forged, is tapered to correspond to the taper placed on the drill rod. The connection assures an absolute attachment to the rod, and yet permits easy removal. The taper socket has been especially designed for the single pass Tee Cee bit.



WESTERN

Rock Bit Manufacturing Company

552 West 7th South • Salt Lake City 4 Utah

United States

Personalities in the News——

Allen F. Agnew has been named state geologist and director of the South Dakota Geological Survey to replace **Dr. E. P. Rothrock** who resigned to enter private practice. Dr. Rothrock became state geologist in 1926. The offices of the Survey will remain at the University of South Dakota in Vermillion, where Professor Agnew is a part-time teacher of advanced and graduate courses in geology.

Charles F. Arnold is now associated with the consulting firm of Melbye and Merwin in Golden, Colorado.

Ralph J. Bernhagen is the new state geologist for the Ohio Division of Geological Survey of the Department of Natural Resources, replacing **J. H. Melvin** who is now with the Pennsylvania Drilling Company in Pittsburgh.

Warren L. Howes has resigned as manager of the Western-Knapp Engineering Company to set up consulting practice at 1305 Hillview Drive, Menlo Park, California.

Philip D. Wilson has been elected a vice president of Callahan Zinc-Lead Company, New York City. Mr. Wilson, who last year as reelected president of the Mining & Metallurgical Society of America, is a consulting mining engineer and geologist. **Leo Model** and **Sam Harris** were elected to the board of directors.

Mord Lewis has been named executive vice president and director of Anaconda Aluminum Company. He has been associated with Anaconda since 1926 and has been vice president of the Anaconda Aluminum Company since October 1956.

Wayne H. Burt, office engineer, operations, at the New York office of Kennecott Copper Corporation, has been awarded a Sloan Fellowship for participation in the executive development program at the Massachusetts Institute of Technology.

Dr. John H. Dismant has been chosen principal engineer in the ore dressing department at the Florida Experiment Station. For the last three years Dr. Dismant has been a metallurgical consultant in the Colorado Plateau area.

W. J. Williams has been named general manager for the taconite operations of Pickands Mather & Co. Mr. Williams served with the U.S. Atomic Energy Commission for seven years before joining Pickands Mather in 1954 to head the taconite construction program. **Donald M. Chisholm** is the new assistant general manager of taconite operations, and **Leonard E. Johnston** has been chosen works manager of Erie Mining Company's taconite operations.

Three professional degrees were awarded at the 57th commencement exercises of Montana School of Mines June 7. Recipients were: **Frank H. MacPherson**, general manager of Dulaney Mining Company, Grand Junction, Colorado; **Plato Malozemoff**, president of Newmont Mining Corporation; and **Joseph T. Roy**, general manager of the East Helena plant of American Smelting & Refining Company. The degree of professional engineer is granted by Montana School of Mines to a graduate engineer who received a Bachelor of Science degree from them or some other noted school and who has established a professional career of at least ten years, five of these years in a definitely responsible capacity, and who has contributed in an outstanding manner to the furtherance of his profession.

Thomas M. Ware, administrative vice president of International Minerals and Chemical Corporation, Chicago, has been elected a director of the company, filling the vacancy created by the retirement of **David M. Milton.**

E. K. Smith has been promoted to purchasing agent for the Reserve Mining Company, Silver Bay, Minnesota. He was formerly with Armco Steel Corporation, Middletown, Ohio.

D. E. M. Kipp has joined Foote Mineral Company as director of research with headquarters at Berwyn, Pennsylvania. Dr. Kipp had been director of one of the research divisions of Aluminum Company of America since 1947.

Joseph O. Montoya and **David M. Pembridge**, employed by the Union Carbide Nuclear Company at Rifle, Colorado, were awarded medals of honor by the Joseph A. Holmes Safety Association. They both risked their lives to save a fellow worker from electrocution. These two were among 18 men in the nation's mineral industries who were awarded medals for heroic action involving the lives of fellow employees. **Marling J. Ankeny**, director of the Bureau of Mines, is Association president.

GEORGE COBB (above right) has been placed in charge of the uranium division of Kerr-McGee Oil Industries, Inc., and is pictured above with E. A. YOUNGBERG (left) who represented the Atomic Energy Commission in the recent signing of a mill contract with Kermac Nuclear Fuels Corporation. Mr. Cobb had been production manager for Kerr-McGee until his recent promotion. V. L. MATTSON (below left), former manager of mining and milling, will direct uranium research for Kerr-McGee, with laboratory and office in Denver, Colorado. DICK ZITTING (below right) will head the uranium exploration division now being established in Oklahoma City. MARION BOLTON has been named manager of Kerr-McGee's Shiprock, New Mexico, mining and milling operations.

Patrick J. Hurley, chairman of the board of United Western Minerals, was recently elected president of the Uranium Institute of America at its first annual meeting in Denver. **Dr. Edward L. Clark**, vice president of Four Corners Uranium Corporation, was reelected secretary-treasurer; and **Gordon A. Weller** of Grand Junction will serve another term as vice president.

Richard F. Steel has been appointed assistant general manager of United States Borax & Chemical Corporation, Los Angeles. He was previously secretary and treasurer.

Donald B. Muckler has been named assistant superintendent of the Canton mine, Biwabik, Minnesota, in Oliver Iron Mining Division's Eastern District. Mr. Muckler was a general mine foreman at the time of this appointment and is a graduate of the South Dakota School of Mines.

James E. Schelske has been appointed assistant superintendent of the Carmi-Carson Lake property of Utica Mining Company, operated by Pickands Mather & Co. He succeeds **LeRoy T. Lang**, who has been transferred to the West Hill mine of Western Mining Company as superintendent, succeeding **J. M. Shields**, assistant superintendent, who has retired.

Dr. Donald S. Taylor has been elected vice president in charge of research for United States Borax & Chemical Corporation to succeed **G. A. Connell**, retired. Dr. Taylor, who joined Pacific Coast Borax Company in 1945 and became director of industrial research in 1955, will make his headquarters in the new $1,000,000 research center which the corporation is now building in Anaheim, California.

W. K. Sanders now has the new position of maintenance superintendent at McGill for the Nevada Mines Division of the Kennecott Copper Corporation. He was previously mechanical-electrical superintendent. At Ruth, **Rush Muse** has been named maintenance superintendent.

William A. Arpi has been named superintendent of the Pilotac concentrating plant, Oliver Iron Mining Division, U. S. Steel Corporation. Mr. Arpi has been a development engineer at the plant since 1953. **Clifford W. Niemi** is the new superintendent of the Extaca agglomerating plant at Virginia, Minnesota. He was formerly assistant superintendent.

Robert E. Deakin has been promoted from assistant general hill foreman to general hill foreman at the Utah Copper Division of Kennecott Copper Corporation. Several new assistant general hill firemen have been named:

Continued on page 111

Flexibility plus!

NEW GARDNER-DENVER DELUXE "AIR TRAC"®

210° Swing

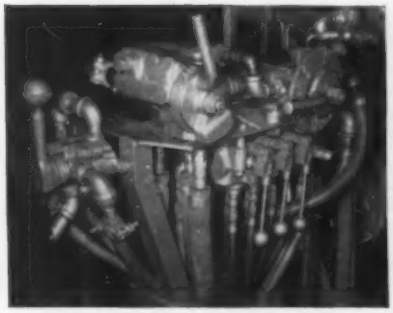
Hydraulic cylinder provides 120° swing, can be indexed for an additional 90° swing.

360° Dump

Hydraulic cylinder provides 90° dump, can be indexed a full 360°.

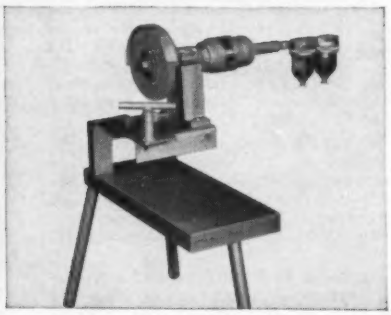
86° T-Bar Lift

Twin hydraulic cylinders provide T-bar lift of 86° 30′, from below horizontal to nearly vertical.



New Remote Control Panel and Driver's Seat—centralized controls provide instantaneous control of swing, dump, T-bar lift, crawler tracks and all drilling operations. Designed for convenience, comfort and safety. Saves minutes and reduces operator fatigue.

New DPAT Hydraulic Drill Positioner —this creep-free hydraulic system maintains alignment at all drilling angles and avoids stuck steel. Provides fast, effortless, power positioning for all vertical, horizontal and flat lifter hole spotting.



New Model G-2 Bit Grinder—this deluxe "Air Trac" extra saves time, too. No need to send back or wait for bits —you sharpen spare bits on the job. Plus new free-wheeling drive shaft design for towing "Air Trac" . . . tool box for tools, bit and coupling storage.

Write for bulletin

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Climb Aboard and Take the Controls at Your Nearest GARDNER-DENVER DISTRIBUTOR TODAY

Newsmakers in International Mining

JAMES L. REID, assistant manager of Roan Antelope Copper Mines, Luanshya, Northern Rhodesia, will visit the United States during July and expects to visit the Utah operations of Kennecott Copper Corporation and mines in the Salt Lake City area. Mr. Reid, who is a native Canadian, has just been to Canada on vacation.

Henry S. Wingate, president of The International Nickel Company of Canada, Limited, received the honorary degree of Doctor of Laws at the Annual Convocation of The University of Manitoba in May. Mr. Wingate's citation paid tribute to Inco's program for aid to higher education in Canada and noted the role the company has assumed in developing the northern part of the Province of Manitoba by opening two nickel mines, at Thompson and Moak Lake, about 400 miles north of Winnipeg.

Dr. B. B. Brock, consulting geologist to Anglo American Corporation of South Africa, Ltd., has been elected president of the Geological Society of South Africa.

V. A. Gorsky has joined the staff of the Geological Survey in Pretoria, South Africa. He was formerly with the Geology Department, University of Natal, Durban, South Africa.

Glen E. Fassler is now with Cuba International Mining & Development Corporation in Santiago, Cuba. He was formerly located at Havana.

Merle H. Guise is now in central Mexico and can be reached through Instituto Allende, San Miguel de Allende, Guanajuato, Mexico.

A. B. MacLaren, technical director of several of the Selection Trust group of companies in Northern Rhodesia, visited the mines of the group on the Northern Rhodesia Copperbelt during April.

Henry A. Brimo was reelected president of Philex Mining Corporation, Manila, The Philippines. **Paul A. Schafer** and **Jose R. Tuason, Jr.** remain vice presidents, and **George T. Scholey**, general manager.

Earl M. Irving has been named manager of exploration activities in Brazil for the Hanna Coal & Ore Corporation. Headquarters of Mineracao Hanna do Brasil, Ltda. are in Sao Paulo. For the last 10 years Mr. Irving has been in Manila with the United States Geological Survey, where he served on the United States of America Operations Mission to the Philippines (International Cooperation Administration). **A. E. Walker**, chief geologist for The M. A. Hanna Company, managed Brazilian activities until Mr. Irving arrival.

Dean F. Frache, chief geologist for Union Carbide and Carbon Corporation of New York, recently visited the mines of Northern Luzon Mining and Industrial Company in the Philippines. He took away with him 1,200 pounds of manganese ore for analysis, reportedly to determine whether Union Carbide will invest in the mining operations.

G. G. Stanley, formerly with East Geduld Mines, Ltd., at Springs, Transvaal, South Africa, is now reduction manager for Marievale Consolidated Mines, Ltd., at Marieshaft, also in the Transvaal.

Victor G. Ford has moved to Portugal from England where he will be associated with Beralt Tin & Wolfram Ltd., at Minas da Panasqueira.

Arthur C. Hall has been transferred to the Southwestern Department of the American Smelting & Refining Company at Tucson, Arizona. Information on his new appointment has not been released. He was formerly vice president and a director of Southern Peru Copper Corporation, in which ASARCO has a major interest.

E. I. Tolstikov of Soviet Russia will speak to a world gathering of scientists in Toronto this September at the International Union of Geodesy and Geophysics. His subject will be "Arctic and Antarctic Investigations of the International Geophysical Year." Mr. Tolstikov is deputy head of the Russian Central Department for the Arctic Seaway by which ships pass north of Siberia from European Russia to the Bering Sea and Pacific Ocean. A United States representative, **Dr. Lloyd V. Berkner**, president of the International Council of Scientific Unions, will speak on "Rocket and Satellite Programs during IGY." The International Council is the central world organization which sponsors the International Geophysical Year.

Otto Weber was reelected president of Surigao Consolidated Mining Company, a gold mining firm in The Philippines. Other officers are: **Henry A. Brimo**, vice president; **H. B. Chambers**, secretary-treasurer-director; and **Felix A. Santos**, assistant secretary.

Alfred Krupp of Germany has been in Turkey recently visiting Karabük steel plants and iron ore deposits and talking to Turkish industrialists. He is reported to be interested in possible capital investments in mining and other Turkish industries by his German Krupp firm.

JACK THOMSON, general manager of Roan Antelope Copper Mines, Luanshya, Northern Rhodesia, has resigned his position and will later assume a position in the London office of the Selection Trust Group of companies. Mr. Thomson, who is from Scotland, joined Roan Antelope in 1929 as an engineering assistant and has been successively work shop superintendent, mechanical engineer, resident engineer, assistant manager, manager, and in 1951 became general manager. He is also a director of the Roan Antelope subsidiary, Ndola Copper Refineries, which was established to treat Roan Antelope blister copper.

BRYAN R. FRISBIE, who was appointed minerals attaché of the United States Embassy in Lima, Peru last December, recently resigned to take a position with the Kennecott Copper Corporation in South Africa. Prior to his appointment in Peru, Mr. Frisbie served as United States minerals attaché at Johannesburg, Union of South Africa for six years.

Ian L. Patterson has retired as chief inspector of mines, Federation of Malaya. Mr. Patterson joined the Department of Mines in 1934, in the former Federated Malay States, and has held the appointment of chief inspector since May 1956. He was mentioned in dispatches for gallant and distinguished service during the Malayan Campaign and was subsequently a prisoner of war for 3½ years. **P. L. Melliar-Smith**, deputy chief inspector, will be acting chief inspector upon Mr. Patterson's departure.

James L. Reid, assistant manager of Roan Antelope Copper Mines, Luanshya, Northern Rhodesia, is visiting mining operations in Canada and the United States.

Charles M. Brinckerhoff was elected a director of the following Anaconda Company subsidiaries: Andes Copper Mining Company, Chile Exploration Company, and Chile Copper Company.

J. Amado Araneta has been reelected chairman of the board of Atok-Big Wedge Mining Company, Manila, The Philippines. **Roberto Cianzon** was named president; **Gregorio Noriega**, vice president and treasurer; **Nicolas Santiago**, secretary. Other directors are **Hector Torres, Gerardo Roxas, Felipe Arriola, and Isidro Dungca.**

D. M. Hogarth, mine superintendent, and **C. M. McGowan**, plant superintendent, of Canadian Exploration Ltd., Salmo, British Columbia, recently visited the Missouri Lead Belt area. Their visit was arranged by **R. J. Mechin**, vice president of St. Joseph Lead Company, Bonne Terre, Missouri.

Luis H. Lizarraga has been named assistant mine superintendent at Cerro de Pasco mine, for the Cerro de Pasco Corporation, Peru. He has been with the company since 1948, most recently as assistant superintendent at Casapalca. **Pieter Viets** has been promoted by the company to concentrating superintendent at Mahr Tunnel. He joined Cerro de Pasco in 1954 at the Paragsha concentrator, later went to Casapalca, and then to the pilot plant in Cerro de Pasco. **Pierre H. Cadiot** is the new industrial engineer-concentrating. Mr. Cadiot joined the corporation in 1951 as assistant mill foreman at Cerro de Pasco, and after several promotions became mill superintendent at Mahr Tunnel.

All Purpose

LIFT-LOADER

BROOM

BERM LEVELER

HUBER-WARCO MAINTAINER

The Huber-Warco M-52 Maintainer with torque converter is an all-purpose, year 'round performer, capable of outperforming many machines that are larger, heavier, more costly, slower, more expensive to operate and more limited in use. With hydraulically controlled attachments, the M-52 Maintainer will perform service as a lift-loader, bulldozer, mower, broom, snow plow, side dozer, berm leveler and patch roller. See your nearest Huber-Warco distributor for details.

BULLDOZER

HUBER-WARCO COMPANY

Marion, Ohio, U. S. A.

HUBER
WARCO

Dawn Mining Finds More Uranium at Midnite Mine

Dawn Mining Company, Newmont Mining Corporation's subsidiary in Washington, has recently discovered two ore bodies at its Midnite uranium mine on the Spokane Indian Reservation, bringing the known deposits to 11, having a value of about $14,000,000.

Ore is now being trucked to Dawn's 400-ton-per-day uranium processing mill 20 miles away at Ford, Washington. According to a contract with the U.S. Atomic Energy Commission, the $3,757,000 plant must take 25 percent of its mill capacity from custom shippers if offered. Kendrick Bay Mining Company in Alaska, owned by Climax Molybdenum, recently made an agreement to sell its uranium ore to Dawn. Mr. Clair Wynecoop, president of Dawn, has said that the new mill could recover thorium as well as uranium.

Stripping of overburden has resumed at the Midnite mine and about $5,500,000 will be spent to get the mine and plant in operation. Newmont has invested $1,600,000 in Dawn and $400,000 has been loaned by a New York bank. Newmont owns 51 percent of Dawn, and Midnite Mines, Inc. hold the remaining 49 percent.

Pinnacle To Seek Pb-Zn Along Idaho-Montana Line

An area six miles long and two miles wide on the Idaho-Montana border at the eastern end of the Coeur d'Alene mining region is to be explored by Pinnacle Exploration, Inc. of New York, exploration subsidiary of Callahan Zinc-Lead Company and Vulcan Silver-Lead Corporation.

More than $1,000,000 may be spent to test the ground obtained from Uranium Mines, Inc. Preliminary work already has started. Pinnacle would advance all funds and recover its investment from first ore receipts. Profits then would be divided 50-50. Uranium Mines would receive $200 a month from the date of the contract and a 4 percent production royalty while development advances were being reimbursed.

The claims border on the west of the Silver Mountain and Princeton properties which are being developed by Hecla and Bunker Hill mining companies.

Expenditure of more than $500,000 on new exploration projects in the *Sunshine* mine and adjoining properties being operated by *Sunshine Mining Company* in Shoshone County, Idaho is recommended in a geological survey report by E. N. Pennebaker of Scottsdale, Arizona, geologist. More than 12,500 feet of crosscutting and drifting, and 33,525 feet of diamond drilling are included; also a proposal for revising the present participation basis. *Sunshine Consolidated, Inc., Silver Syndicate, Inc., Polaris Mining Company,* and *Silver Dollar Mining Company* participated in the cooperative study.

Fire destroyed the 1,200-ton lead-zinc mill of *American Smelting and Refining Company* at the *Morning* mine, Mullan, Shoshone County, Idaho. Loss from the blaze, which started with an explosion in the electrical substation at the mill, was estimated at $500,000. The main mill building was constructed more than a half century ago. Replacement cost was estimated at $1,000,000. Lower levels of the Morning mine were abandoned as worked out several years ago and the mill had been handling between 200 and 300 tons of ore daily before the fire. About 180 men were employed in mine and mill. At last report, no decision had been made about rebuilding.

Six small Coeur d'Alene Mining Region companies are planning to merge. They are *Altura Mining Company, Hill Mining and Milling Company, Mohawk Silver-Lead Mining Company, Paramount Mines, Inc., Yreka Mining Company,* and *Yreka United*. The latter would be the surviving firm under the proposal approved by directors of all the firms and expected to be ratified by stockholders.

Good grade lead-silver ore across a substantial width has been opened on the 300 level of the *Dayrock* mine north of Wallace, Shoshone County, Idaho. The new ore structure in a previously unexplored section of the mine was indicated by diamond drilling. The mine is owned by *Day Mines, Inc.* of Wallace; Henry L. Day is president. The Dayrock shaft has been deepened to the 1,250-foot level, and at the firm's *Hercules* mine north of Burke work has started on a winze to open the Rambler vein from the 1600 level to the 1900.

Nabob Silver-Lead Company has been driving raises and doing other development work preparatory to stoping lead-zinc ore from its new winze operation on Pine Creek, Shoshone County, Idaho. The ore shoot has been opened for about 300 feet west of the winze. C. C. Dunkle of Kellogg is vice president and manager.

The *Bayhorse* group of lead-silver claims near Challis in central Idaho now are under development by the *Bunker Hill Company* of Kellogg, Idaho, and San Francisco. The company took a purchase option last summer and carried out geological work. A tunnel is being driven to test a target area.

The old *Livingston* mine of *Idaho Custer Silver-Lead Mines, Inc.* near Challis, Idaho, will be explored and developed at greater depth under a $120,000 project. *Hecla Mining Company* of Wallace, Idaho will do the work under an arrangement whereby it can obtain a 60 percent interest in Idaho Custer's property, surface plant, and mill by reimbursing that firm for cost of the work. The shaft will be deepened 250 feet with aid of a $42,500 government exploration loan; 800 feet of crosscutting and drifting and 2,300 feet of diamond drilling will be done on the new 2500 and 2750 levels. Alvo V. Alvensleben of Seattle heads Idaho-Custer.

Polaris Mining Company has developed some good new ore in its *Silver Summit* mine, Shoshone County, Idaho, at about the 2,800-foot level in a raise from the 3000 level and additional exploration is planned on the 1500 level. In the Purim area, a short ore shoot has been opened on the 2500 level, and a discovery has been made by diamond drilling into the south wall. In the Rainbow area, uphole diamond drilling was underway at last report to test an ore-bearing north-south structure opened on the 3000 level.

A new underground exploration project has been started by *R-G Mining Company* at its *Beaver Creek* property 12 miles north of Wallace, Shoshone County, Idaho. A new adit has been started to gain depth on lead-silver ore discovered at the surface and in old upper workings last year. Ray D. Klepinger of Kellogg is president and manager; J. E. Van Gundy of Spokane, Washington is consulting engineer.

The West Rambo ore shoot of *Silver Syndicate, Inc.*, in the silver belt of the Coeur d'Alene mining region, Shoshone County, Idaho, has been reached from the bottom 4,000-foot level of the *Sunshine* mine. Where intersected some distance west of where ore had been expected, the Silver Syndicate fault-vein contained a foot of solid silver-lead ore.

Lucky Friday Silver-Lead Mines Company has completed its current shaft extension to a depth of 3,130 feet. This will permit opening of five new deeper levels at 150-foot intervals below the present bottom 2300 level. Shipments for the first four months of this year totaled 55 cars of lead-silver concentrates netting an average of $14,000 per car and two cars of zinc concentrates. Charles E. Horning of Wallace is president.

General Mines Corporation has reopened the caved portal of its main adit southwest of Kellogg, Shoshone County, Idaho, and made electrical and ventilation repairs to permit inspection by a large mining firm. H. G. Loop of Spokane is managing director.

Golconda Lead Mines has sharply curtailed mining operations at its mine east of Wallace, Shoshone County, Idaho, because of lead-zinc price declines. The Golconda mill is operating a capacity seven days weekly on ore from other properties, principally the *Lucky Friday* mine. John A. Featherstone of Wallace is president.

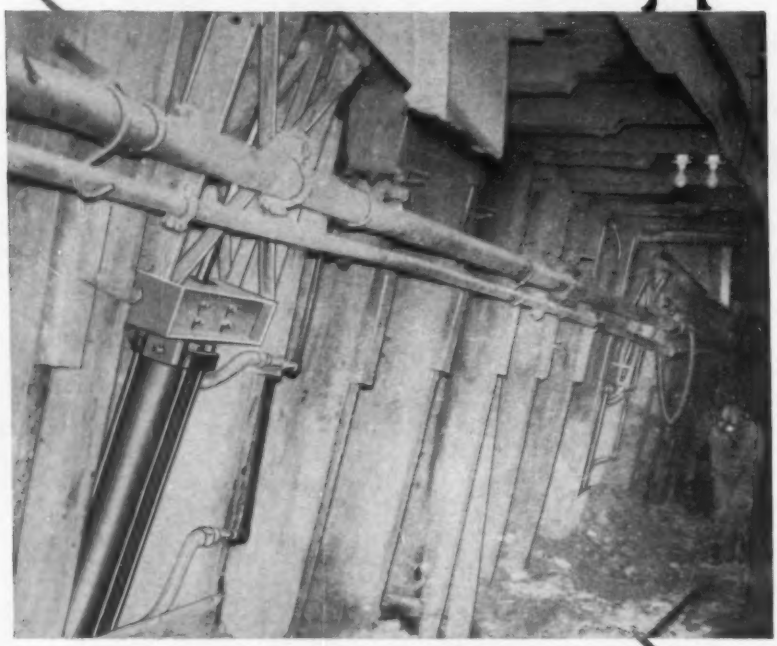
A new ore structure has been discovered in the Rotbart area of the Coeur d'Alene mining region's silver belt, Shoshone County, Idaho, at a depth of 4,000 feet. New ore also has been opened in the area on the 3700 and 3850 levels assaying about 50 ounces of silver to the ton over a five-foot width. *Sunshine, Polaris,* and *Silver Dollar* mining companies share production in this area.

Hall Mountain Thorite Mining Company is extending a tunnel started last fall on a five-foot vein of thorium-bearing ore at its property on Hall Mountain near Porthill, Boundary County, Idaho. Ore is being stockpiled. Bruce R. Berringer of Spokane is president-manager.

The *Bunker Hill Company* started up its fifth electrolytic unit in the zinc plant at Kellogg, Idaho three months ahead of schedule. It is now in full production at a rate of about 43 tons of zinc per day. Zinc plant daily capacity will be 200 tons or approximately 73,000 tons per year of Special High Grade Zinc. In 1956, the capacity had been only 57,799 tons, with only four units in operation. The sixth unit will go into operation in 1958, adding another 43 tons daily to plant capacity.

Idaho Goldfields, Inc. has unwatered its 168-foot inclined shaft and resumed mining of lead carbonate ore following a winter shutdown. Finer grinding equipment has been added to the small mill on the property in Fourth of July Canyon

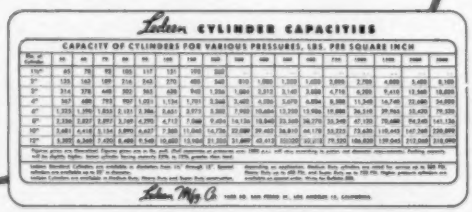
HOW MUCH CYLINDER POWER DO YOU NEED?



Western Copper Mine Uses Ledeen CYLINDERS to Operate Chute Gates on Raises

These 8" dia. Ledeen Cylinders, operating underground, are giving dependable round-the-clock service day-after-day. It is this kind of service that makes Ledeen Cylinders first choice where reliability, long life and low maintenance are required. Standard cylinders available from stock in 1½" through 12" bores. Special cylinders up to 20". These cylinders offer a wide range of capacities to meet your power requirements.

How much CYLINDER power do YOU need?


Ledeen CYLINDER CAPACITIES

CAPACITY OF CYLINDERS FOR VARIOUS PRESSURES, LBS. PER SQUARE INCH

Ledeen Mfg. Co.

Write for Bulletin 500

Send for this cylinder capacity chart. It will help you determine the size Ledeen Cylinder you need to meet your power requirements.

Ledeen Mfg. Co.
3338 North Gilman Road
El Monte, California

VALVES • CYLINDERS
VALVE ACTUATORS
AIR-HYDRAULIC PUMPS
AND BOOSTERS

east of Coeur d'Alene, Kootenai County, Idaho. L. A. Thompson of Spokane is president.

Clearwater Mines, Inc. has resumed work at its silver-copper-gold property in southern Shoshone County, Idaho following a winter and spring shutdown. H. G. Loop of Spokane is president, and E. I. Fisher of Spokane is secretary-treasurer.

Sidney Mining Company has penetrated more than 500 feet into ground of the adjoining *Nevada-Stewart Mining Company* property under an operating agreement and at last report was less than 350 feet from the first objective. The properties are in the Pine Creek district of the Coeur d'Alene mining region, Shoshone County, Idaho. Malcolm C. Brown of Kellogg is president of Sidney.

Silcoa Mining Company of Tacoma, Washington is testing a silica deposit on the Herman Glander farm near Blanchard, Bonner County, Idaho. Diamond drilling will determine the size and purity of the deposit.

A two-foot vein of lead-silver ore were exposed in Fourth of July Canyon east of Coeur d'Alene, Kootenai County, Idaho by a road crew. Members of the crew staked the discovery and others soon had filed claims on the surrounding area.

Western Mica Corporation of Deary, Idaho has been incorporated with a capitalization of $5,000 by Orville J. and Jacqueline R. Slette of Deary and F. W. Mallory of Bovill.

Low metal prices and rising costs have shut down the 40-year-old *Hull Lease* lead-zinc mining operation at Gem in the Coeur d'Alene mining district, Shoeshone County, Idaho. The lease included the *Gem* mine and portions of the *Frisco* mine. Mining equipment is being salvaged and sold. The mill will operate on a custom basis until it can be sold. H. J. Hull of Wallace is one of the principal partners.

MONTANA

Bolin Shaft Sinking Company of Canada has started sinking the Missoula-Gulch shaft of *Anaconda Company* at Butte, Montana. Work is progressing rapidly at the Ryan shaft site, although sinking has not started yet. The development of the inclined conveyor system to remove ore from the Berkeley Pit is also progressing rapidly. The inclined shaft which carries the conveyor belt is being sunk and it is now almost under the south edge of the pit.

Minerals Engineering Company is conducting a deeper drilling program with heavier drill equipment on its *Carter* iron ore deposit in Montana. Large tonnages of ore have been blocked out but the firm wants to determine more definitely the magnitude of the reserves.

Montana Gold and Chemical Company has resumed production of placer gold this season at its operation near Gold Creek, Montana. A small-capacity, bucket-line floating dredge is used. Also starting up again this season is the *Jefferson Gulch Mining Company* whose placer operations are in Jefferson Gulch, about 15 miles

west of Avon, Montana. This company uses a dragline to load a floating, screening, and washing unit.

Vitro Uranium Company has agreed to purchase two carloads of uranium ore from the *Lucky Joe* prospect near Darby, Ravalli County, Montana for further amenability tests. A 46-pound sample was too high grade to provide an accurate test, officials said. Meanwhile, downhole diamond drilling was undertaken by the operating firms, *National Uranium Corporation* and *Hypotheek Mining and Milling Company* of Wallace, Idaho to check values at depth.

Anaconda Aluminum Company has curtailed production of primary aluminum by 25 percent at its Columbia Falls, Montana plant. The 5,000-ton monthly capacity was cut by 12.5 percent on June 1 and another 12.5 percent on July 1. Company spokemen say that there has been a gradual reduction in domestic consumption of aluminum resulting in heavy inventories for the firm.

Young-Montana Corporation is making regular shipments of iron ore from its *Willow Creek* mine at Stanford, Montana this year. The property was developed last year, and some shipments made; output will double this year, however.

OREGON

The *Harvey Aluminum Company* has started drilling for bauxite on 900 acres optioned in the Rosedale area, south of Salem, Oregon. The options are on separate properties in an area about three miles wide and six miles long. First options expire in December 1958. The company operates an experimental alumina plant in North Salem, which was built by the government during World War II to determine whether alumina could be removed from the clay. A new $60,000,000 fabrication plant was built by Harvey at The Dalles, Oregon. State geologists reported in 1954, after examining the area, that average thickness of bauxite ore there is about 14.4 feet. It is found in mounds of the rolling hill country and was deposited by lava flows millions of years ago.

A tungsten prospect on Foots Creek in Jackson County, Oregon has been leased to *Calnevore Corporation* of Los Angeles, California by Guy O. Woolf of Gold Hill. Exploration work is underway. Scheelite occurs in a quartz vein rather than the usual tactite formation. Some pyrite and minor amounts of galena also occur, as well as values in gold and silver.

Atomic Metals Inc. has installed a pilot plant to test cinnabar ore deposits on Quartz Mountain near Lakeview, Oregon. The deposits have been leased from Don Tracy, Dean Lange, and Ross Foster, all of Lakeview.

WASHINGTON

The old *Bonanza* lead mine near Colville, Stevens County, Washington, is

Open Top and Sides Permit:
1) Continuous Inspection
2) Easy Accessibility

See how easily you can observe every phase of the operation of this open-type heavy-media vessel, and how readily it can be maintained. Then investigate: (1) Its simplicity; entire process is performed by one moving part; little to go wrong. (2) Its quiet pool surface with large productive separating area. (3) Its unique drive; no power transmission trains. (4) Its low installation cost. Examination will disclose this vessel's substantial economies in production and maintenance. Models for all HM needs.

Our pilot plant houses commercial-size HMS system

For details of OCC Vessel's unprecedented simplicity, Send for HMS Bulletin. Pilot plant testing service

THE ORE & CHEMICAL CORP.
DIVISION: MINING & MILLING MACHINERY

80 Broad St., New York 4, N. Y.

WOOD TANKS
NO CORROSION
NO RUST

MINING TANKS
FOR ALL PURPOSES

Thickener Tanks •
Solution Tanks •
Agitation Tanks •
Water Storage Tanks •
Wood Stave Tailings Pipe •

Write - Phone - Wire for . . .
MINING TANKS BULLETIN

SANTA FE
TANK
DIVISION
FLUOR PRODUCTS CO.
A Division of
The Fluor Corporation, Ltd.
12000 E. Washington Blvd.
Whittier, California

being examined by the *Bunker Hill Company* of Kellogg, Idaho, under an option to purchase. Geophysical survey work and diamond drilling were scheduled. The option was obtained from Earle B. Gibbs of Coleville, who took more than $2,000,000 worth of ore out of the mine.

A four-foot zone of uranium ore giving chemical assays of 0.64 and 0.45 percent uranium oxide across the north and south walls was cut in a shaft at the *Lowley* lease of *Daybreak Uranium, Inc.*, on the Spokane Indian Reservation, Stevens County, Washington. The intersection was made at the 52-foot point in a 32-degree incline, or about 40 feet beneath the surface were narrow stringers were uncovered. Drift work was underway, at last report. At the firm's *Dahl* lease open-pit mine in the Mount Spokane District, Spokane County, work has exposed an ore-bearing fault zone dipping at 75 degrees, in addition to the original flat-lying ore zone. Development work has been resumed at the company's nearby *Huffman* lease open-pit operation.

An open-pit lead-zinc-silver mining operation is planned by *Utahcan, Inc.* in Pend Oreille County's Jim Creek area on ground obtained under lease and purchase from pospectors George and Henry Rushmier. The firm has purchased a 75-ton concentrator at the old *Young America* mine near Bossburg, Stevens County, Washintgon, to move to the Jim Creek property. L. L. Lorang, Spokane, is president.

Howe Sound Company is moving mine and mill equipment from its *Holden* copper-zinc-gold operation in Chelan County, Washington for resale or use in other company operations. The mine was to be closed June 28 because low metal prices made continued operation unprofitable. About 200 men were affected.

Geo-Resource Corporation, formerly *Mine Consultants, Inc.*, has located 52 mining claims in the Russian Creek area of the Metaline lead-zinc district, Pend Oreille County, Washington and has added a geophysics department headed by Lewis L. Oriard of Marshall. In cooperation with *Lands, Inc.*, also of Spokane, the firm has acquired a half interest in the *Red Ridge* tungsten group of seven claims in northern Pend Oreille County. William Weaver is president.

Mudhole Exploration Company is planning exploration of a 53-claim uranium prospect in the Ruby mining district of Pend Oreille County, Washington acquired from Charles M. Mashtare of Spokane.

Sunny Peak Mining Company has installed 2,200 feet of air pipe preparatory to extending its main tunnel at the *Mineral Hill* mine near Conconully, Okanogan County, Washington, to develop the Buckhorn vein. C. J. Weller of Republic is company president, and E. I. Fisher of Spokane is secretary-treasurer.

Ore reserves at the Metaline, Washington zinc-lead district property of *Pend Oreille Mines and Metals Company* now are figured at more than 20,000,000 tons. Drilling ahead of the present working area has disclosed milling-grade ore 140 feet thick, compared to an average of 30 feet mined to date. Another hole showed 125 feet of milling ore and 170 feet of additional mineralization, part of which is ore. Monthly output has been stepped up to more than 65,000 tons and management is considering enlarging the present 2,400-ton mill. Jens Jensen, Spokane, is president.

Silver Mountain Mining Company is completing a 250-ton concentrator at its gold-silver property six miles west of Tonasket, Okanogan, County, Washington. Miners are completing a shaft project to get additional depth on ore structures. Arthur G. Nickelsen of Tacoma is president.

Highnoon Uranium Mines, Inc. is stockpiling ore at its *Lost Creek* property in Pend Oreille County, Washington. C. N. McJunkin, president, is directing field operation. J. Fred Williams Jr., Pullman, is consulting engineer. Mrs. William McClurg, Spokane is new secretary-treasurer.

Starlight Uranium, Inc., has started development work on its nine claims midway between Usk and Chewelah in northeastern Washington. Open-pit mining was planned. J. H. Zickefoose, Spokane is president.

High-grade autunite has been found in a 2½-foot-wide kaolin clay seam over a distance of more than 60 feet at the Mount Spokane district property of *Dahl Uranium Mine, Inc.* Heavy mineralization also has been found in an adjoining pegmatite contact. Extensive drilling and bulldozer stripping are planned. Harwood J. Tibbits of Spokane, Washington is president.

Dawn Uranium and Oil Company has contracted to explore and develop a 160-acre tract in the Mount Spokane district of Washington under a profit-sharing operation agreement with *American Leduc Uranium Corporation*. The ground adjoins *Daybreak Uranium's* principal open-pit mine on the west. American Leduc discovered some autunite in preliminary drilling last year. Virgil R. Chamberlain of Great Falls, Montana, consulting geologist, will direct work. Dawn Uranium also has leased two other prospects in the same district for exploration. C. R. Echlin, Spokane, is secretary-treasurer.

Hecla Mining Company of Wallace, Idaho plans to move its geological headquarters to Spokane, Washington to expand its investigation of mining properties. Herbert E. Harper, Hecla's chief geologist, will be in charge of the new office.

The *Crystal City Mining Company* of Spokane, Washington is doing some core drilling on its property at Miles in Lincoln County, to determine the depth of the scheelite vein which is opened on the surface across a 25-foot face to a depth of about 20 feet and proven in length by bulldozing approximately 400 feet. The firm is also drilling a lead-silver vein on the southwest part of the property which showed values near the surface of 20 percent lead, 7.8 percent zinc, and 5 ounces silver per ton. This showing is some 600 feet southwest of the main shaft and adit.

E. B. Laird of *Lucky Day Mines*, a subsidiary of *Laird Mining Company*, has located two mining claims in the Flowery Trail area, Pend Oreille County, Washington. Among other early-season claim filers at the county seat of Newport were Lloyd E. Sherrill, Kenneth R. Bagdon, and Richard J. Rickashel of Spokane and E. Mosher, F. Favor, T. Monk, F. Monk and H. Monk of Newport.

Granore Company, subsidiary of *Granby Consolidated Mining, Smelting and Powder Company, Ltd.* of Canada, has abandoned exploration of the old *Lone Star* copper property north of Curlew, Ferry County, Washington. Drilling results were reported "successful" in 1955 but "disappointing" in 1956.

Rock-Drilling Symposia Planned by Three Schools

The success of the Second Symposium on Rock Mechanics held recently at the Colorado School of Mines in Golden, Colorado reflects the increasing widespread interest in this subject not only in the United States, but all over the world. Theme of the meeting was "Behavior of Materials in the Earth's Crust".

Latest developments both home and abroad were examined by the group. Applications of structural geology and petrology to rock mechanics were discussed. The field of stress and strain instrumentation underground, together with the interpretation of these measurements, was well covered. Highlight of the final session was the concise summary of happenings at the Symposium presented by Clifton W. Livingston, the "father of rock mechanics".

Future Symposia will be held under the joint sponsorship of the department of mining engineering at the University of Minnesota, Pennsylvania State University, and Colorado School of Mines. At present these schools sponsor three symposia which, in addition to rock mechanics, include drilling and blasting, and exploration drilling. It is now planned that all symposia will rotate among the three schools and that each symposium will be held every other year. Better geographical representation, both in papers and attendance, should result with a wider dissemination of knowledge to the mineral industries.

The tentative schedule is as follows:

Year	*Drilling and Blasting*	*Exploration Drilling*	*Rock Mechanics*
1958	Minnesota		
1959		Penn State	Colorado
1960	Colorado		
1961		Minnesota	Penn State
1962	Penn State		
1963		Colorado	Minnesota

A new $1,500,000 byproduct plant is under construction at the *Climax Molybdenum Company* operation at Climax, Colorado. The new building is being erected immediately west of the present byproduct plant; it will be three times larger physically and metallurgically twice as big. Two parallel circuits will be installed so that half of the plant can be shut down for repairs while the other half continues in operation. Humphrey spirals will be used without prior classification. Half of the plant is expected to be finished by December of this year, and the remainder in February 1958 when full operation should begin.

Warren Oil and Uranium Mining Company of Denver, Colorado has purchased all of the outstanding stock of *Plateau Uranium Company* of Moab, Utah from *Federal Uranium Company*. Principal asset is the *Yellow Circle* mine located 18 miles from Moab, which is currently producing about 850 tons of ore per month. The company has also purchased *Neptune Uranium Company's Shamrock* mine in the Red Canyon, or Vixen, mining district of Montrose, Colorado. In addition to two underground mines now on the property from which Neptune has been delivering carnotite ore, an ore body of about 4,000 tons was blocked out by a DMEA drilling program. Operations are already underway to mine this ore by an incline 70 feet from the rim. Warren has moved its main office from Fort Worth, Texas to Denver, and maintains a field office in Moab, Utah.

The *New York* mine in the Breckenridge district of Colorado is now shipping lead-silver ore to the *American Smelting and Refining Company* plant at Leadville. The mine, an old-time producer, is owned and operated by the *Knight Mining Corporation*. Old workings have been cleaned out and present development work is on a vein above the old tunnel extending into virgin ground.

The *United States Atomic Energy Commission* has signed a one-year contract with the *Cotter Corporation* of Santa Fe, New Mexico for the purchase of U_3O_8 to be produced in a pilot plant at Canon City, Colorado. The plant will process uranium-bearing ores of the Front Range and eastern slope area of Colorado owned or controlled by the corporation. Scheduled to go into operation about December 1, the pilot plant work will be conducted by Cotter, aided and assisted by the *Colorado School of Mines Research Foundation, Inc.*

The *Camp Bird* mine at Ouray, Colorado has closed down because the owners and operators, *Camp Bird Ltd.*, were unable to make a satisfactory agreement with the union on wages. The Camp Bird had only recently been taken over for operation by the owners; for a number of years it had been under lease to *King Lease, Inc.*

New Idria Mining & Chemical Company, which owns large mercury and tungsten properties in California, has a $53,444 DMEA contract for uranium exploration in Mesa County, Colorado. The government's share is $40,083.

The famous *Little Fannie* mine, near Silverton, Colorado, first located in 1874, has been sold to Frank Richardson of Ouray, Colorado. The mine has produced lead-silver ore over the years, and has been worked under a lease a number of times in the past 17 years. Seller was the estate of John Gilheany.

The *Rex Uranium Corporation* recently has acquired 13 claims contiguous to its presently producing mines, two claims in the Long Park area, eight claims in the Gypsum Valley, and 10 claims in the La Plata Mountains, all in Colorado. In addition, the firm has an option on a base metal property near Telluride, Colorado.

Two recent mining incorporations in South Dakota are: *M.D.W. Development Company*, formed by Patrick C. Robuck of Rapid City, Paul Rourke, Einar Lodahl,

Gilsonite Pipeline Goes Into Operation

The first pipeline ever built to transport solid materials over mountainous country has gone into operation. Running from the mines of the American Gilsonite Company at Bonanza, Utah, the $2,000,000 pipeline extends 72 miles over the towering Book Cliff Mountains to the company's new refinery, scheduled for completion soon, at Gilsonite, Colorado, near Grand Junction. This is the first privately financed refinery in the United States to produce, on a large scale, conventional petroleum products from solid hydrocarbons. Gilsonite, a trade-marked name, is the mineral raw material used. It is mined from vertical seams and is coal-like in appearance. The pipeline will carry a mixture of crushed Gilsonite ore and water which will be converted into high-grade metallurgical coke and gasoline at the new refinery. The gasoline will be marketed in the Rocky Mountain area. The coke will be sold to aluminum producers and other industries for recarburizing and special metallurgical uses. For virtually all of its length the pipeline crosses uninhabited country over some of the most rugged terrain in the west. It spans two large canyons via suspension bridges and crosses an 8500-foot mountain pass. Beginning at the company's mines in Bonanza, the 6-inch pipeline will be able to transport 700 tons a day of Gilsonite ore. The entire pipeline is laid at a reasonably flat slope (see above), except for two miles past the summit of Baxter Pass, the highest point, where 21° slopes were necessary. Initially, solids concentration of 35 percent Gilsonite—65 percent water will be sent through the 6-inch line. Uniform slurry will be maintained by two 200,000-gallon tanks at Bonanza which will be held under constant agitation.

An Unfailing Market for:

GOLD • SILVER • COPPER
LEAD • ZINC

Ores • Concentrates • Bullion
Precipitates • Furnace Products

FOR SCHEDULES, FREIGHT RATES, ETC., WRITE TO YOUR NEAREST OFFICE

AMERICAN SMELTING AND REFINING CO.

405 Montgomery Street
San Francisco 4, Calif.

700 Crandall Bldg.
8-10 West 1st South St.
Salt Lake City 1, Utah

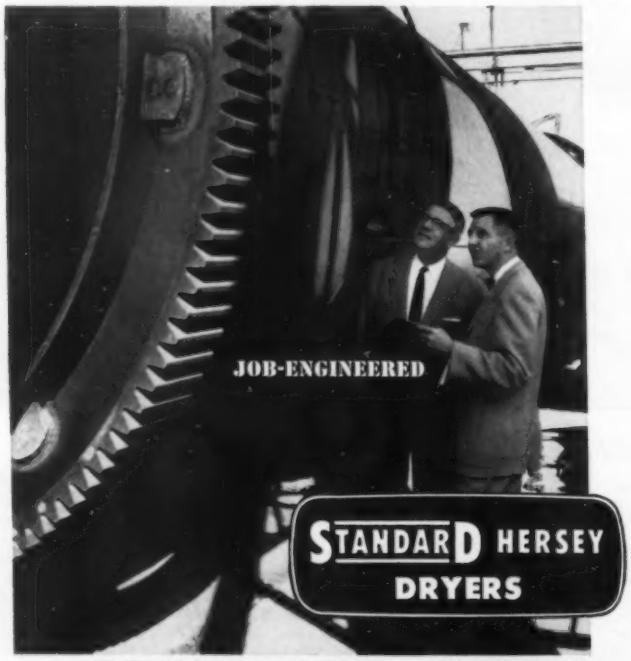
P. O. Box 1111
El Paso, Texas

P. O. Box 1605
Tacoma 1, Wash.

607 First National Bank Bldg.
Denver 2, Colorado

East Helena, Montana

810 Valley Bank Building
Tucson, Arizona



STANDARD-Hersey ROTARY EQUIPMENT IS TOUGH...RUGGED...Right For The Mining Industry!

Whether your drying, cooling, or calcining requirements are simple or difficult, there's a heavy duty, job-engineered Standard-Hersey rotary unit that performs smoothly, economically for years! Standard Steel engineers are familiar with every difficult rotary equipment problem of the mining industry. Famous name customers year after year return to Standard Steel for their new rotary equipment.

If You Have a Processing Problem!

Standard Steel welcomes the opportunity to discuss with you any problems you may have in drying, cooling, or calcining. Our laboratory pilot testing equipment determines beforehand the best rotary equipment for your particular problem.

STANDARD-HERSEY GOES ON STREAM AT AMERICAN GILSONITE'S NEW REFINERY

Illustrated is the new cooler for the American Gilsonite Company. It has a water cooled feed and chute for pre-cooling and a specially designed "floating inner jacket" to protect the outer shell. Tough and rugged gears are machined for smooth operation. It's job-engineered.

STANDARD STEEL CORPORATION

General Offices and Factory, 5031 Boyle Avenue, Los Angeles 58, Calif.
(Division of Standard Steel Corporation)

LEADER IRON WORKS

Decatur 31, Illinois
Eastern Sales Office, 15 Park Row, New York 38, N. Y.

ROTARY DRYERS • KILNS • COOLERS • ASPHALT PLANTS

and Henry Wolff of Gilette, Wyoming, and Carl Cantonwine of Spotted Horse, Wyoming; *Deadbroke Mining Company* by Earl and Joyce Hoffman of Central City, L. W. and Delores Schuchardt and William G. Huck of Spearfish.

Homestake Mining Company has sunk its interior winze shaft to 5,705 feet at its gold mine in Lead, South Dakota. Drifts are now being advanced along the ore zones on the 5,300- and 5,600-foot levels.

UTAH

Continental Materials Corporation, formerly *Continental Uranium Inc.*, soon expects to be producing about 6,000 tons per month at its *Rattlesnake* mine in San Juan County, Utah. It has been steadily producing about 5,000 tons monthly for some time. In October of last year stripping of over 2,500,000 cubic yards of overburden was completed. The company recently purchased all of the assets of *Old Texas Mining & Oil Company* of Dallas, Texas. Included are 775 uranium claims covering a total of 15,000 acres in Colorado, New Mexico, and southeastern Utah.

Cog Minerals Corporation, a subsidiary of *Colorado Oil & Gas Corporation*, has taken over development of *Uranium King* properties in the White Canyon area of San Juan County, Utah. The properties are between Cog's *Bullseye* and *McCarty-Coleman* mines. Cog has operated the Bullseye on a lease and royalty basis; now all property owners, including those of the Bullseye and Uranium King, will share in 40 percent of the net from the operation. Cog is currently mining about 3,000 tons per month in this area. A successful process for upgrading the ores reportedly has been developed by the firm.

At the *Ransom* uranium mine near Blanding, Utah, *Sunshine Mining Company* is producing 400 tons of development ore monthly. Of the total, 250 tons is being shipped to a processing plant. The remainder is being stockpiled.

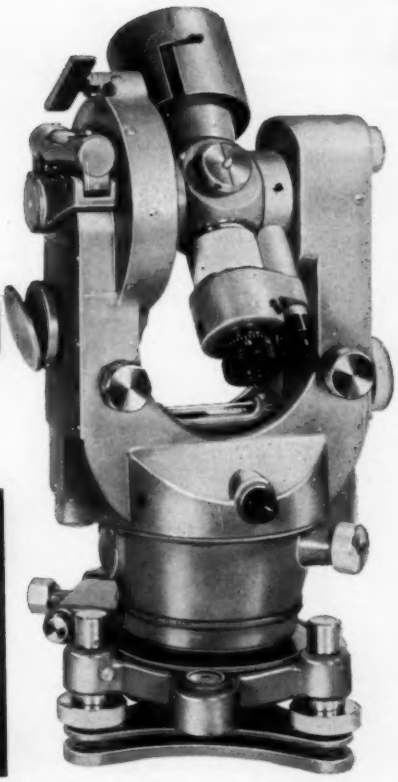
On the adjoining *Rocky* group of 36 claims, *Sidney Mining Company* and *Mascot Mines, Inc.* of Kellogg, Idaho, have disclosed promising anomalies by geophysical methods. Drill tests are planned. The firms have shipped several hundred tons of development ore from the *Colorado River* mine in San Juan County's Hatch Point area. Malcolm C. Brown is president of Sidney.

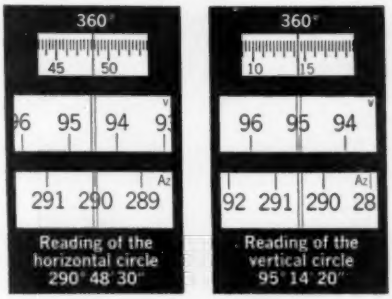
WYOMING

A 40-ton test shipment has been made from the new *Fanny May* open-pit mine in the East Gas Hills by *P-C Mining Company* to the AEC buying station at Riverton, Wyoming. Steady production from the mine, located on the *Thunderbird* claims, is to start soon, according to John D. Cummings, vice-president and general manager. The ore is located 60 to 75 feet below the surface, with some high-grade ore pods assaying more than 10 percent U_3O_8.

WILD HEERBRUGG

T-1 Optical Repeating Transit





By day or underground, this WILD *instrument offers unprecedented advantages*

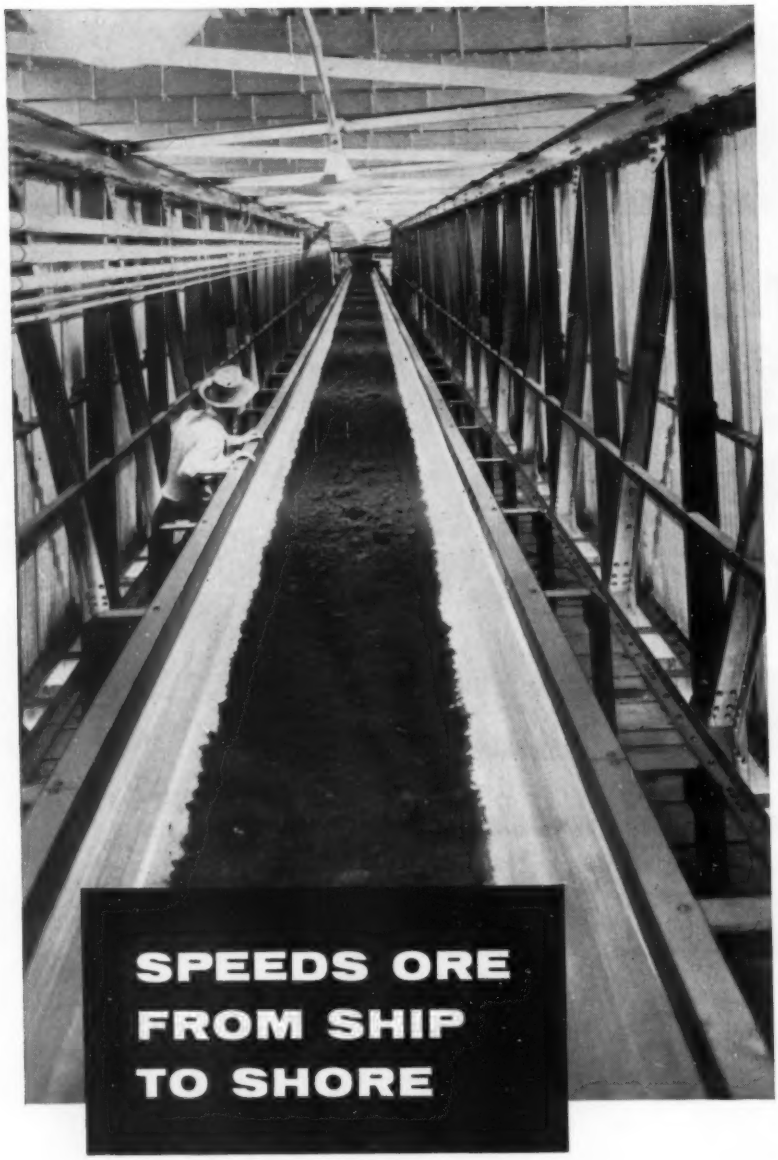
From its optical excellence to its mechanical precision the T-1 has earned a world-wide reputation for great performance. Users everywhere praise the instrument for its rapid set-up, high accuracy and virtually unlimited versatility!

NOTABLE FEATURES OF THE WILD T-1

- Reads direct to 20 seconds with interpolation to 10 seconds, on both horizontal and vertical scales.
- More than a dozen accessories are available for quick, simple, accurate solution of routine and special problems.
- Built-in illumination for both circles, scale and reticle.
- Rugged, precision construction throughout.

PRICE: $718; F.O.B. Port Washington, N. Y. Tripods extra. Write for Booklet T-1.

WILD HEERBRUGG INSTRUMENTS, Inc.
Main at Covert Streets · Port Washington, N.Y. POrt Washington 7-4843
SALES • FULL FACTORY SERVICES



This Hewitt-Robins slope conveyor takes ore from a 48" H-R dock conveyor which runs the length of the Canton Railroad ore pier in Baltimore. It carries 3,000 tons of ore per hour up a 16° slope into a weighing station for loading into railroad cars.

This continuous flow of materials cuts handling costs, speeds turn-around time for ships and shore carriers. Here, as in hundreds of industrial applications, Hewitt-Robins engineered, manufactured, and installed the complete bulk materials handling system. Consult your classified telephone directory for the nearest H-R distributor or sales office, or contact Hewitt-Robins, Stamford, Connecticut.

HR HEWITT-ROBINS

CONVEYOR BELTING AND IDLERS . . . POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE . . . VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

ROCKY MOUNTAIN

The *Wyoming Highway Commission* has made an on-the-spot examination of possible routes for relocation of four miles of main state highway at the iron ore prospect being evaluated by *Columbia-Geneva Steel Division* of *United States Steel Corporation* 25 miles south of Lander, near the ghost gold mining town of *Atlantic City*. Relocation of the road, known as the South Pass Highway, would be necessary if the company decides to go ahead with development of the huge low-grade deposit, which would supplement ore supplies for the blast furnaces at the company's Geneva plant near Provo, Utah. Cost of the relocation has been unofficially estimated in excess of $1,500,000, which would be borne by the steel company. Possible locations and cost are part of the information needed by the company in deciding if it will go ahead with the large project. Although hampered by bad weather, crews of *Boyles Brothers*, Salt Lake City, Utah, drilling concern, are making progress in a large test drilling program at the iron deposit. The core drilling is of an exploratory nature, with the amount to be determined by results encountered as the work progresses. Earlier drilling was done by *Nichols and Thompson* of Boise, Idaho.

Two States Uranium Company, working in conjunction with *Valley Dean Corporation*, has resumed operations on the *Redwood* mine pit in the East Gas Hills area of central Wyoming. L. T. Johnson, Ogden, Utah, contractor, is removing an additional 160,000 cubic yards of overburden and will mine 60,000 tons of uranium ore. Mr. Johnson opened the original pit with removal of 425,000 cubic yards of overburden and mined 25,000 tons of ore. Mining should start soon at the rate of 2,000 tons per day and will be stockpiled. In the present stripping program, a 30- to 60-foot face of ore will be exposed for 300 feet.

Union Carbide Nuclear Company, which has an option on the *Aljob* mine and property in the Gas Hills uranium district in central Wyoming, has opened an office in Reverton, Wyoming. Charles Bromley is geologist in charge.

General Uranium, Inc. of Spokane, Washington has acquired the *Box* claims in the Powder River Basin of Converse County, Wyoming, and has shipped three carloads of carnotite to the Edgemont, South Dakota processing plant operated by *Mines Development, Inc.* A new mineralized zone has been uncovered and drilling has indicated several deposits of substantial tonnage. Test drilling is planned north of the Box group on a 50-claim property.

Fremont Minerals Incorporated, newly organized subsidiary of *Susquehanna Corporation*, is negotiating with the Atomic Energy Commission for the sale of concentrate from a uranium ore processing mill the firm would build in the Gas Hills area of Fremont County, Wyoming. The company proposes to construct a mill utilizing the new solvent extraction process to treat both low lime ores from the Gas Hills and Copper Mountain areas, and the high lime ore from Montana and northern Wyoming. It would operate as a custom mill. Already authorized and under construction in the Gas Hills are mills for *Lucky Mc Uranium Corporation* and *Western Nuclear Corporation*. Susquehanna, through *Mines Development Inc.*, is owner and operator of the mill at Edgemont, South Dakota which was described in the January 1957 issue of MINING WORLD, pp 36-43.

Marions Teamed For Steady Big Production

Two Marion 151-M shovels are hard workers in this area of Minnesota's rich iron ore country. The team of machines operates 16 hours a day, 6 days a week, stripping overburden composed of glacial drift, Virginia slate and taconite.

There's a machine in the Marion line that is just right for smaller digging jobs, too. Shown above is the 35-M, a speedy hard-working ¾-yard shovel, which has the same kind of stamina as its big brothers.

CONSULT MARION *MINING SPECIALISTS*
for lowest costs on your property!

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

MAGMA COPPER COMPANY

Buyers of

COPPER, GOLD AND SILVER ORES

MINES AND SMELTER AT SUPERIOR, ARIZONA

PURCHASERS OF

LEAD AND ZINC

CONCENTRATES

THE BUNKER HILL COMPANY

Producers of Top Quality Products

LEAD • ZINC • CADMIUM • SILVER • LEAD AND LEAD ALLOY PRODUCTS • CHEMICAL PRODUCTS

WIRE PHONE WRITE | ORE PURCHASING DEPT. • THE BUNKER HILL COMPANY
Telephone: Kellogg 2261 • P. O. Box 29, Kellogg, Idaho

International Smelting and Refining Co.

ANACONDA
from mine to consumer

Buyers of

Copper, Silver & Gold Ores and Concentrates:

Copper Smelter—Miami, Arizona

Address: Ore Purchasing Department
International Smelting and Refining Co.
P. O. Box 1265
Miami, Arizona

Lead & Zinc Ores and Concentrates

Lead and Lead-Zinc Smelter
Lead-Zinc Concentrator
} Tooele, Utah

Address: Ore Purchasing Department

International Smelting and Refining Co.

818 Kearns Building
Salt Lake City, Utah

Please establish contact prior to shipment.

AMERICAN ZINC, LEAD AND SMELTING COMPANY

Buyers of Zinc Concentrates Suitable for Smelting in Retort and Electrolytic Smelting Plants, also Buyers of High Grade Lead Concentrates.

Address Communications to Ore Buying Department

Paul Brown Building
ST. LOUIS, MISSOURI

423 Mills Bldg.
EL PASO, TEXAS

927 Old National Bank Building
SPOKANE, WASHINGTON

P.O. BOX 577
DUMAS, TEXAS

Boron-10 Plays Important Part in Atomic Energy

The United States Atomic Energy Commission has recently released information on another metallurgical plant which plays an important part in the atomic program. It is the Hooker Electrochemical Company's Model City, New York, boron-10 plant.

The plant has been operated by Hooker under an AEC contract since June 1954 and is the largest of its kind in the Free World. The plant was designed and constructed by the New York engineering firm of Singmaster and Breyer. Though it was built on a "crash" basis, the plant was turned over to Hooker 165 days ahead of the initially planned construction program.

Because Boron-10 has a high neutron absorption capacity, it has two vital uses in atomic energy for protection against neutrons and control of the neutron phases of nuclear fission. B-10 is 20 times more effective in absorbing thermal neutrons than lead and 500 times better than concrete. However, B-10 will never replace concrete and lead because it is ineffective in shielding against gamma rays. This makes B-10's primary use as a neutron absorber.

Boron is a mixture of about four parts B-11 and one part B-10, the numbers indicating the small differences in molecular weight. Separation involves five major steps.

The *St. Joseph Lead Company–Bethlehem Steel Corporation* iron mining project at Pea Ridge, Missouri has been turned over to a new joint company named the *Meramec Mining Company*. Earl Bilheimer is resident manager of the new firm. According to present plans, two shafts will be sunk. The first, a 3,000-foot exploration shaft, will be started in September. The deposit appears to be about 2,000 feet long, 300 feet wide, and apexes at about 1,400 feet below the surface. The ore will be magnetically separated after crushing and grinding. Work is already nearing completion on a new road to the mine site, and consideration is being given to permanent power lines and transportation arrangements.

A 6-ton Diesel locomotive is now operating at the 19th level of *No. 4 Ahmeek* mine of *Calumet & Hecla, Inc.* at Calumet, Michigan. The Diesel has more power than the battery locomotives now in use in the division mines and can pull a greater load. There is a grade on the 19th level of No. 4 Ahmeek, over which the Diesel is now pulling three tram cars; the limit with a battery locomotive had been one tram car.

Mine La Motte Corporation is sinking a shaft to open up the lead ore body on property located 30 miles south of the Lead Belt in southeast Missouri. Although initial difficulties with mud and water have caused problems, it is not expected to change the initial estimate for the cost of the work. The corporation is jointly owned by *St. Joseph Lead Company* and *National Lead Company*, with general management by St. Joe.

The seventh annual Exploration Drilling Symposium of the *University of Minnesota* will be held at the Center for Continuation Study in Minneapolis, Minnesota, on October 3, 4, and 5, 1957. The sessions will cover geophysical instrumentation of small bore holes; small bore hole surveying; reliability and weighing of drill hole analyses; diamonds and synthetics for drill bits; air and mud drilling; personnel training and drill standardization. The program is sponsored by the School of Mines and Metallurgy and the Center for Continuation Study. Applications for registration may be obtained by writing to the Center for Continuation Study at the University.

White Pine Copper Company, a subsidiary of *Copper Range Company*, is increasing its annual copper production to 100,000,000 pounds by the end of this year. An output of 80,000,000 to 90,000,000 pounds is expected to be achieved within the next few months. Copper Range reports that output was oversold during the March quarter of this year, and all copper had been sold through April and May. The management foresees very little difficulty in disposing of the output during the remainder of the year.

Allied Chemical & Dye Company reportedly will build a $10,000,000 uranium salts plant near Metropolis, Illinois. The plant will manufacture uranium hexafluoride for the Atomic Energy Commission and will be the first privately owned plant to make this product. Production is scheduled to start late in 1958 or early in 1959.

American Cyanamid Company's Industrial Chemicals Division is installing calcining facilities at Bauxite, Arkansas. Completion date is set for the end of this year which is the company's 50th Anniversary Year. The calciner will treat bauxite from the company's *Quapaw* deposit, located about 20 miles from Little Rock. The company's other bauxite mines are located in Adairsville, Georgia, and Berger, Arkansas. The new facilities will include an office and laboratory, in addition to complete equipment for mining, grinding, calcination, magnetic separation, and shipping the ore.

The Michigan State Legislature has been considering a bill which would authorize the State Conservation Department to lease publicly owned mineral rights under the Great Lakes to private mining companies. The State Senate has already approved the bill. *U.S. Metals Company* is said to be investigating the upper peninsula for low-grade copper deposits. It is understood that the rock beds under the lakes would be explored only if the strata indicated the presence of ore beyond the landfall.

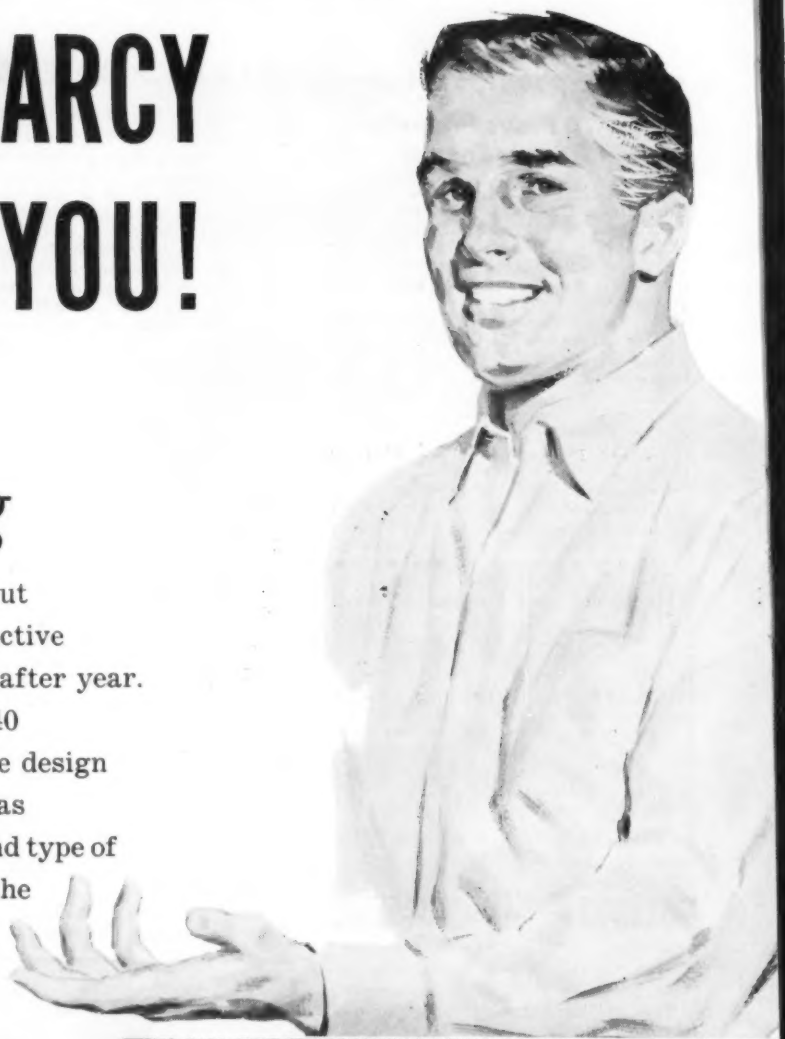
American Zinc Company of Tennessee is currently producing about 4,000 tons of ore a day at its Tennessee operations. By the middle of 1958, the rate will be increased to about 5,000 tons, and by the end of next year to 6,000 tons. The increased output will come from the *Young* mine near the firm's major *Mascot* property, and from the *Coy* mine at Jef-

Union Carbide Moves Yuba Dredge to Florida

Yuba Consolidated Gold Fields dredge No. 154, known as the Waterford Dredge, was recently sold to Union Carbide and Carbon Corporation, who plans to use it to recover titanium mineral concentrates from sands of Amelia Island off Florida's east coast, about 30 miles northeast of Jacksonville. The dredge has a pontoon-type hull which will facilitate shipment and rebuilding. This is the first use of this type of dredge for mining Florida beaches; however, Marine Minerals Corporation operates one in South Carolina. The bucket ladder gold mining dredge, which previously operated near Hickman and Lockford, California, was equipped with 9-cubic-foot buckets to dig 35½ feet below water level. The dredge now displaces 950 tons but will have a displacement of 2,000 tons and handle 500 tons of sand an hour after modification by Yuba Manufacturing Division of Yuba Industries, Inc. The sand will be wet-concentrated on the dredge hull and tailing from the operation will be deposited at the rear of the dredge and the dredged area restored and replanted. About 15 tons an hour of heavy minerals will be recovered with 485 tons of tailing. The increased weight of the dredge indicates the additional equipment that will be required to recover the titanium minerals economically. Union Carbide will use the rutile and ilmenite concentrates to produce titanium sponge at the largest United States titanium plant at Ashtabula, Ohio.

see what MARCY can do for YOU!

they just keep rollin' along



It's not unusual for Marcy Mills to put in 98% or 99% of total time in productive operation, month after month, year after year. That's because Mine and Smelter's 40 years of specialized experience in the design and manufacture of grinding mills has resulted in a selection of materials and type of construction which stand up under the most severe, continuous service.

COMPARE THESE IMPORTANT MARCY MILL CONSTRUCTION FEATURES...

Removable, special bronze alloy bushing will not scour, is easy to replace.

Heavy bearing sole plates dampen vibration and shock load to concrete foundation.

Self-aligning ball and socket trunnion bearings.

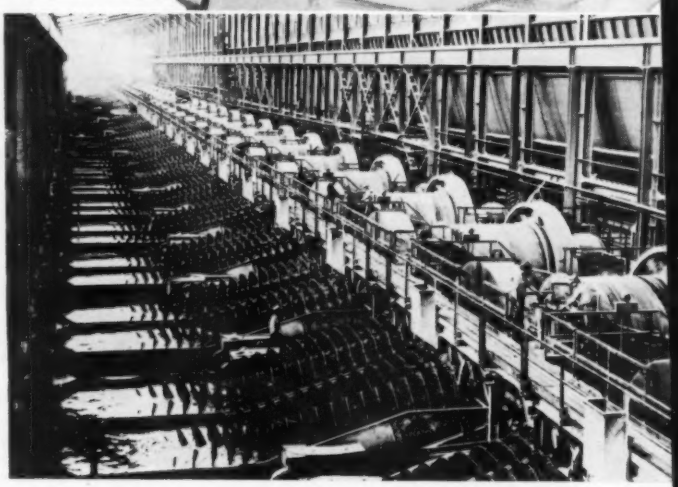
Meehanite Metal heads...Meehanite's uniform density, high tensile strength, fatigue strength, rigidity and impact strength provide qualities of toughness and resilience.

Heads are separate from shell...if a trunnion is damaged you do not have to replace entire mill. Trunnions can be furnished separate from heads.

Male and female fits on flanges take shear off of bolts and assure proper alignment.

Heavy plate steel shell.

Gears have cut teeth, are split and reversible.



Typical installation of Marcy Mills in a large copper mill, where big tonnage, continuous operation are essential to profitable milling.

NO EXTRA CHARGE FOR MARCY® EXPERIENCE

THE MINE AND SMELTER SUPPLY CO.

DENVER NEW YORK SALT LAKE CITY EL PASO

SALES AGENTS AND LICENSED MANUFACTURERS THROUGHOUT THE WORLD

ferson City. The recent price drop in zinc is not expected to affect these operations too much because *American Zinc Lead & Smelting Company*, the parent company, is largely a refiner of custom ore purchased at the daily market quotation for the refined metal.

The Joint Congressional Committee on Defense Production has had several recent proposals for increasing nickel production. One has already been approved—the expansion of the *Nicaro* plant in Cuba by *Freeport Sulphur Company*. Under consideration are suggested plans by *International Nickel Company of Canada, Ltd.* and *Bethlehem Steel Corporation*. The INCO proposals reportedly involve the recently discovered *Mystery Lake* and *Moak Lake* deposits in Manitoba, Canada with an estimated production potential of 180,000,000 tons annually. INCO requests a guaranteed government market for nickel produced if unable to sell it to industry. Bethlehem proposes to build a plant in Cuba with an annual output of from 30,000,000 to 70,000,000 pounds of nickel. Under this contract the government would not be obligated to purchase the nickel but would have an option to purchase one-half of the production at 10 percent below market price. Bethlehem requests a government loan to a Cuban corporation in which Bethlehem will own all of the stock. Bethlehem would contribute $7,500,000 in property and facilities.

Bechtel Corporation has received the engineering and construction contract for the new $88,000,000 aluminum reduction plant which *Reynolds Metals Company* will operate at Massena, New York. Grading and site preparation are under way for the 100,000-ton plant which will be located on the St. Lawrence Seaway. The project is scheduled for completion by November 1, 1959.

Ura-Mang Corporation has started shipping manganese ore to the government stockpile from its newly completed plant in the Horse Cove area of Washington County, Tennessee. The company's mining leases total almost 7,000 acres in Unicoi and Washington counties of Tennessee. The firm expects initially to mill about 45 tons a day. The new plant has a capacity of more than 25,000 tons annually.

The price of zirconium is expected to drop from its current price of $12.50 per pound to $7.50 per pound when *Carborundum Company's* new plant at Parkersburg, West Virginia goes into production. The company is now producing 325,000 pounds yearly, all going to the AEC; the new plant, with a capacity of 1,200,000 pounds, will sell 500,000 to the AEC, and the latter has an option on 300,000 pounds more. Zirconium was sold in 1956 at $15,00 per pound.

Lithium Corporation of America, Inc. has been able to increase its proven reserves of mineable ore above the 400-foot horizon at its Kings Mountain, North Carolina operation by more than 50 percent without indication of lessening quantity or quality in the major deposits. This reserve alone is adequate to supply current capacity of its Bessemer City plant for more than 20 years. Exploration and development work is continuing.

International Minerals & Chemical Corporation set a nationwide record recently when it shipped the largest cargo of triple superphosphate in the history of the phosphate industry. The 11,500-tons shipment went from Tampa, Florida to New Orleans, Louisiana; eventual destinations were Minneapolis, St. Paul, St. Louis, and Peoria where it would be delivered by river barge.

A $9,200,000 contract has been awarded by the government to *Metal Hydrides, Inc.* for production of sodium borohydride. The chemical compound, which is used in making high energy fuels for jet aircraft and guided missiles, will be delivered over an 18-month period beginning in October when a plant is scheduled to go into operation. The chemical will be delivered to the *Olin Mathieson Chemical Corporation* at Niagara Falls, New York, when the final fuel will be produced.

Archdale Mines Inc. has been formed in Kings Mountain, North Carolina to explore for mica on the *Archdale Farm* properties, owned by C. E. Neisler. Incorporators of the new company are I. M. Allen, C. T. Bennett, and J. A. Neisler.

Extensive deposits of ilmenite have been found in the Ocean-Burlington county area of New Jersey, according to the state's *Department of Conservation and Economic Development*. The original find was made in a pit just west of Route 539 and four miles east-southeast of New Egypt in western Ocean County by a state geologist. Several firms are said to be actively exploring in the area, while the state continues its efforts to determine the over-all extent of the mineral.

Ramapo Uranium Corporation, operating a uranium mine three miles southeast of Warwick in Orange County, New Jersey, has signed a contract with the AEC for sales of 50,000 pounds of uranium oxide. The company is producing from a small 10-ton pilot plant. If it proves successful, the company will erect a 300-ton plant to process its own ore and any custom ore in the area. This apparently is the first production from any state east of the Colorado Plateau. The pilot plant has been operating since August 1956 using the Jarman process, which is of the magnetic-gravity separation type. It does not use chemicals or water. Mining operations are under the direction of R. M. Atwater Jr., who estimates reserves at a minimum of 25,000 tons of proven ore, 177,000 tons of probable ore, and 1,200,000 tons of possible ore. Two adits are being driven, and it is planned to complete 3,000 feet of drifting by the end of summer.

The *American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME)* will issue an 800-page volume on the economics of the mineral industry late this year, or early in 1958. Covering a wide range of subjects, the book is written by eminent authorities in their respective fields. It is directed largely to the senior student in mineral technology and to the young graduate. The AIME also has recently reorganized its structure. Previously known as the mining, metallurgical, and petroleum branches of AIME, these units are now the Society of Mining Engineers of AIME, the Metallurgical Society of AIME, and the Society of Petroleum Engineers of AIME. Each has its own officers but remains under control of AIME board of directors.

International Salt Company has requested lease rights to mine salt under Lake Erie off the shore at Cleveland, Ohio. International Salt wants to lease 5,100 acres under the lake and 200 acres under Whiskey Island, for which it would reimburse the state of Ohio 5¢ per ton on all salt mined. The company proposes to invest around $7,000,000 in the operation.

The *United States Bureau of Mines* is seeking metallurgists, ore dressers, engineers (mining, petroleum, mechanical, and electrical), chemists, physicists, nuclear physicists, and qualified specialists in other technologies. Vacancies range from GS-5 ($4,480 annually) to GS-12 ($7,570). Write to the Bureau in Washington, or to any of the field offices.

American Smelting and Refining Company is expanding its central non-ferrous metal research laboratories at South Plainfield, New Jersey by one-third. The new addition will be devoted to asbestos application and process research for ASARCO's subsidiary, *Lake Asbestos of Quebec Ltd.*; to the production and study of high purity metals; and for research on refractory metals such as rare earths and other high temperature metals. Full operation is expected by the end of the year.

IRON RANGES

The *Grant* iron mine at Buhl, Minnesota has been leased to the *E. A. Young Corporation*. An ore treatment plant will be constructed when operations commence. The Grant mine is a State of Minnesota Fee and has been operated very intermittently up to the present time.

The *Jones & Laughlin Steel Corporation's* Arthur retreat flotation and spiral plant went into operation during the week of May 20. The first two weeks were spent producing spiral concentrates of highgrade and the flotation section was started on May 31. The plant feed is the tailing from a former washing plant located near the site of this new plant at Calumet, Minnesota. With the large tonnages of fine tailings in storage on the western end of the Mesaba Range, this process is certainly of immediate concern to all mining organizations and is being watched closely by all mining companies on the Mesaba Range since it is the first flotation operation there.

Iron Ore shipments from Upper Lake ports through May 19, 1957 amounted to 11,863,391 gross tons, compared with 13,377,288 tons at a similar date during 1956.

Among the processing improvements that have been made at various mines on the Mesaba Range is the addition of a fines treatment section consisting of Remer jigs at the *Troy* mine for *Rhude & Fryberger*, Eveleth, Minnesota. The section was added to produce a high-grade concentrate from the classifier sands which formerly went direct to concentrates. The section started operation in the middle of May and has been producing since that time. This section supplements the conventional heavy media section installed in the plant last year.

Jones & Laughlin Steel Corporation's Minnesota Ore Division expects to bring its new *Lind-Greenway* mine on the western Mesabi into production for the 1958 season.

The new beneficiation plant of *Pickands Mather & Co.* at the *Mahoning* mine in Hibbing, Minnesota will be in operation this season on the Mesabi Range.

ASARCO Is High Bonus Bidder for Three Papago Indian Tracts in Tucson, Arizona Copper Boom

The American Smelting and Refining Company was the high bonus bidder on three tracts of Papago Indian Reservation land south of Tucson, Arizona, shown on the accompanying map with bids totaling $1,066,007.04. ASARCO's bids were the highest received from four mining companies when bids were opened on May 13th by the Bureau of Indian Affairs at Sells, Arizona.

ASARCO as high bidder received, subject to the consent of the individual landowners, an exclusive right for two years to prospect for minerals other than oil and gas, with an option to lease at any time during that period up to 2,560 acres of land in each permit. Leases will be drawn for 10 years and as long thereafter as minerals are produced on the lease in paying quantities. Royalty, 10 percent of net smelter return, is subject to Federal review and adjustment at the end of the first and each successive 10-year period.

Bids for the tracts were as follows: No. 1, $283,000.00; No. 2, $757,002.04; and No. 3, $26,005.00. Total bids, $1,066,007.04. All the land involved is allocated land with the exception of a 160-acre tract in No. 2 which is tribal land with 427 individual owners. Tract No. 1 contains 5,120 acres; No. 2, 5,183; and No. 3, 5,120.

Other bidders were the Banner Mining Company which bid $357,644.98 for Tract No. 2; Pima Mining Company with bids of $37,000 for Tract No. 1 and $87,000 for Tract No. 2; and American Metal Company Ltd. with bids of $2,713.60, $10,496, and $2,713, respectively, for the three tracts.

Also shown on the map is the location of ASARCO's previously controlled land in Section 36, R. 12. E., T. 16 S. where a prospecting campaign by diamond and churn drilling has been underway according to reports. ASARCO will drill the tracts after bid is approved. To the south is Pima Mining Company in Section 36, R. 12 E., T. 16 S. where an open-pit mine has been developed to supply a 3,000-ton-per-day flotation mill.

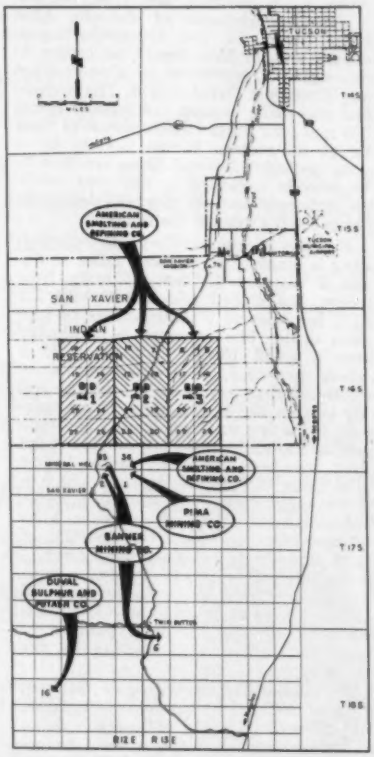
West of Pima are the properties of Banner Mining Company in Section 2 of R. 12 E., T. 17 S., and Sections 35 and 36, R. 12 E., T. 16 S. Banner is operating the 250-don-per-day Little Daisy underground mine due west of Pima and the 450-ton-per-day Mineral Hill mine west of the Daisy. The company's 1,000-ton-per-day copper flotation mill is located at the Mineral Hill. Banner's Copper Glance mine in Section 6, R. 13 E., T. 18 S. is producing 200 tons per day.

Banner has been active in the area since the early 1950's. Pima started an extensive geological and geophysical prospecting campaign in the area in November 1949. In February 1951 Pima started drilling to check geophysical anomalies and the first hole hit copper sulphides at 255-foot depth. This ore was buried under 200 feet of alluvium and it was one of the most important geophysical discoveries made in the western mining districts in many years.

More recently, Duval Sulphur and Potash Company has developed 14,665,000 tons of ore assaying 0.77 percent copper and 0.0197 percent molybdenum, together with 34,150,000 tons of 0.60 percent copper and 0.0216 percent molybdenum-bearing materials, in Section 16, R. 13 E., T. 18 S. Duval is planning to develop a 10,000-ton-per-day open pit and build a flotation mill in the area.

The entire Papago area is covered with alluvial wash for the most part, but, in the vicinity of Mineral Hill, limestone and granite crop out and have resisted erosion to form a low group of hills. Ore occurs at or near the contacts of intrusive granites with interbedded Cretaceous limestones, arkoses, and quartzites.

Ore deposits are typical of pyrometasomatic mineralization with contact zoning of ore and high temperature minerals. Pyrite, chalcopyrite, bornite, chalcocite, and magnetite have replaced the permeable arkosic and limey beds and in places extensive and true dissemination of ore minerals has taken place.



Structure has been most important in localizing mineralization. The Mineral Hill area is crossed by an east-west premineral thrust fault. Folding of the sediments has been another important factor with the Pima ore body developed along the top of a steep anticline. A much large. but much flatter anticlinal structure apparently occurs to the north of Pima with mineralization in the arkose along the limbs. As the area is covered with up to 300 feet of alluvium, detailed geology has been interpreted from drill results, exposures in the Pima pit, and from Banner's underground mines.

The Duval ore body apparently is somewhat different, with only very low-grade mineralization in a monzonite intrusion. One theory is that ore is found in brecciated volcanic rocks over the monzonite; another that ore is found in highly altered arkoses on top and around the flanks of the intrusive. Secondary enrichment is reportedly more important there.

According to the bid invitation forms, the successful bidder (ASARCO) is required to obtain the signatures of the Indian permitters. Acreage for which signatures cannot be obtained is excluded from the permit and the bonus bid reduced proportionately. If after showing the exercise of reasonable diligence and that he is unable to obtain the signatures of the landowners for at least 80 percent of one block of 2,560 acres lying anywhere within the tract, the successful bidder may withdraw his bid and recover any moneys paid to the superintendent incident to the bid except the bidder's proportionate share of the cost of advertising. The superintendent shall hold in a special fund any bonus paid by the successful bidder. Should the superintendent determine that the required signatures have been obtained, he shall within 30 days after return of the executed permit deposit to the credit of the signing landowner the bonus that remains in a proportion that the acreage they have signed for bears to the whole acreage signed for within the tract.

The permit will grant an exclusive right for a period of two (2) years from the date of approval by the Commissioner of Indian Affairs or his authorized representative to prospect for all minerals except oil and gas. The Permittee may lease at any time during the term of the permit up to 2,560 acres of the lands embraced in the permit, and such additional acreage as the Secretary may determine as fringe acreage necessary for a successful mining operation. The permittee shall include in the lease only such acreage as is reasonably proven productive, supported by factual information, together with that additional acreage which is necessary for its mining operations. Mining operations shall include areas for open-pit, construction of improvements, and disposition of waste materials. The area covered by a lease shall be in a reasonably compact body and shall conform to the system of public land surveys. During the life of the lease, each lease shall be developed diligently and no acreage may be dropped from the lease.

For the payment of royalty, each lease is considered a unit whereby each landowner participates in the royalty in the proportion of the amount of his land in the lease. For all minerals, except uranium, coal, and asphaltum, unless otherwise provided in the lease, the royalty is 10 percent of the net smelter return.

Ambrosia Lake Agreement By Vanadium Corporation

Vanadium Corporation of America has entered activities for the first time in New Mexico's Ambrosia Lake uranium district, through an agreement with United Western Minerals and its farmout group. VCA will earn a 50 percent interest by providing required financing for sinking a shaft and conducting all mining operations on Sec. 36, T. 14 N., R. 10 W. United Western will retain an undivided 25 percent working interest.

Preliminary investigations on this section by Chapman & Wood, Consulting Geologists of Albuquerque, resulted in proving an ore body in the Brushy Basin member of the Morrison formation. VCA will undertake an additional 50,000 feet of drilling in the area.

New Flotation Mill Erected By Cyprus Mines At Recently Re-opened Old Dick Property

A new 200-ton-per-day flotation concentrator was put into operation, during May, by Cyprus Mines Corporation at the Old Dick property, three airline miles southwest of Bagdad, Arizona. Built by O. W. Walvoord, Inc., the mill is producing copper and zinc concentrates from high-grade ore recovered by sub level stoping at the Old Dick mine. Initially feed to the mill will be held at 3 to 4 percent copper and 20 to 24 percent zinc. This means that approximately 26 tons of copper concentrate and 75 tons of zinc concentrate will be recovered each day.

Cyprus acquired the Old Dick mine, which has had a past history of production, in 1955. Following considerable exploration work, the existing 450-foot-deep vertical shaft was extended to the 575-foot level and development work was conducted on the 225-, 300-, 400- and 525-foot levels. In plan, the orebody is oval shaped near the surface, but at the lower levels it becomes pipe-shaped. Stoping is carried out from the lower three levels of the mine. Ore is extracted by blasting drill-rings in sub level drifts. A unique feature of the mine is that all ore is slushed to the shaft, and traming is not now necessary.

Ore hoisted from the mine is crushed in a plant adjacent to the headframe. The crushing plant consists of a Denver 18- by 24-inch primary jaw crusher and a Traylor 3-foot gyratory crusher. The Traylor unit is in closed circuit with a vibrating screen. The mine and the crushing plant are operated one shift per day.

A 552-foot conveyor links the crushing plant with two, 100-ton capacity, circular-steel fine ore bins at the concentrator. The mill is an extremely compact unit with the grinding, classifying, flotation

and filter sections located on one floor. A partial deck below the operating floor contains all pumps and sumps as well as a regrind mill for rougher copper concentrate. These latter units are easily visible to operators through the grate decking of the operating floor.

The primary Marcy ball mill at the concentrator is in closed circuit with a rake classifier. Classifier overflow reports to copper conditioners and then to a line of 10 Denver flotation cells. Copper concentrate is cleaned in a line of four Denver flotation cells. Tailing from the copper section is conditioned for zinc flotation which is carried out in a bank of 10 Denver flotation machines. The zinc rougher concentrate is also cleaned in four Denver cells. Finished concentrates are trucked 27 miles to a rail terminal at Hillside, Arizona.

Operating personnel at the Old Dick mine include Curtis Sundeen, resident manager; Joseph Pimentol, mill superintendent; David Turbeville, mine foreman.

The *San Manuel Copper Corporation*, San Manuel, Arizona, reports that production currently is running at about 85 percent of rated capacity. This compares with a rate of about 65 percent at the end of 1956. During the first quarter of 1957, the San Manuel mine produced 26,990,251 pounds of copper, and full production is expected by July.

The *Shannon Mining Company* is continuing the production of copper ore from its *Shannon* mine at Gleeson, Arizona, making shipments to both the International smelter at Miami and the ASARCO smelter at El Paso. Shannon is a subsidiary of *Illinois Zinc Division* of *Hydrometals Inc.* which recently announced the closing of mining and milling operations at its Peru properties in New Mexico. Jerry Faust of Silver City, New Mexico, is general manager of the company.

The increased exploration and development work carried on last year by the *Banner Mining Company* at its properties near Tucson, Arizona, is said to have indicated three rather large ore bodies, the extent and grade of which have not been fully determined. The added facilities which were installed at the company's Mineral Hill mill have given the plant a capacity of over 900 dry tons of ore per day, and the new surface plant at the *Copper Glance* mine at Twin Buttes is in operation. Banner's contract with the government for copper at a fixed price was more than two-thirds completed at the year's end, and at the present rate of delivery another year will be required to fulfill the contract. Banner reported a net profit of $440,909 for the year 1956, after depletion and state and federal income taxes.

The *Jay Bird* and *Sun Valley* uranium claims owned by *Uranium-Petroleum Company* in Coconino County, Arizona have been sold to *Bemco Mining Company* of Los Angeles, reportedly for more than $1,000,000. Uranium-Petroleum has been active in the Marble Canyon area for some time, and has retained 14 claims for further exploration.

The United States Atomic Energy Commission has granted shipping permits for radioactive materials to the following Arizona operators: *Lucky Mining Company* from the *Wanderlust 1-5* claims in Mohave County; Otis B. Taylor from the *Star 1* and *Badger 1* claims in Whetstone mining district, Cochise County; *Haralson & Sons* from *Flattire* and *Elexis* claims in Graham County; *Utomic Exploration & Mining Corporation* from the *Gold Crown* property in Navajo County; and *Utco* from the Navajo Reservation properties in Coconino County. The list indicates the potential new uranium districts in Arizona.

The *Copper World* mine, located northeast of Yucca, Arizona, has been taken over by the *Bobcat Mining Company*. A winze is being sunk in the adit tunnel where the vein and ore body were cut.

The *B S & K Mining Co.* of Phoenix, Arizona, suspended production early in May following the drop in the price of zinc. Only a development crew is being retained at the company's *Atlas* mine, near Redrock. Earlier, the company had expected to ship 5,000 ton of zinc concentrates this year. A. M. Kalaf of Phoenix is president and general manager.

Griscom Metals Corporation reportedly has filed notice with the Gila County Recorder of an agreement covering property in the Inspiration-Needles area near *Castle Dome* holdings west of Miami, Arizona. The firm has obtained a lease from Mrs. Marguerite Bower Copp which calls for payment of a minimum fee $500 per month for the first year, and a minimum of $1,000 per month for the nine following years.

Hearings have been held in California on the first dispute over Public Law 359 passed in 1955 which permits placer mining in power reserve areas under certain conditions. The U. S. Forest Service is protesting the *Surprise* placer claims of David H. Kenison covering about 80 acres on the bank of the Kern River in the Richbar area of Kern County, just below a recreational area. Mr. Kenison has amended the original boundaries to exclude areas used for fishing and picnicking, and has offered to post a $10,000 bond to guarantee restoration of the area to its original state after cessation of operations in about five years. He is seeking gold at the foot of a prehistoric waterfall which he believes once flowed through the property. A decision has not yet been announced.

The *Anaconda Company* has closed its *Darwin* mines, 38 southeast of Lone Pine, California for an indefinite period. The mines had been reopened in January 1955 after an 11-month shutdown. The same reason is given this time for the cessation of operations—low market price of lead and zinc makes continuation of operations unprofitable.

Gypsum Carrier, Inc., a wholly owned subsidiary of *Kaiser Gypsum Company, Inc.*, is transporting chromite ore from *Consolidated Mines, Inc.'s* operations at Masinloc in the Philippine Islands to Redwood City, California. From here, the ore is trucked to the Kaiser plant at Moss Landing.

The $15,000,000 expansion program at *Titanium Metals Corporation of America's* plant at Henderson, Nevada is making

PRIMACORD

Detonating Fuse

Plain • Reinforced • Wire countered • Plastic

SAFE

Complete detonation . . . no unexploded caps or powder. Cannot be set off by friction, sparks, ordinary shock; even a direct hit by lightning did not detonate Primacord.

EFFICIENT

Contacts every cartridge, even in deck loads. Initiates entire charge almost simultaneously. Can be hooked up to fire front line first, giving relief of burden and better fragmentation.

ECONOMICAL

Lowest overall cost because you get full efficiency from the explosive—no waste; and better fragmentation with less powder. Only one cap required—no cap in the hole.

COAST MANUFACTURING & SUPPLY COMPANY ESTABLISHED 1867 LIVERMORE, CAL.

PRIMACORD - BICKFORD
Hot Wire Fuse Lighters
Detonating Fuse
Safety Fuse
Celakop

Ask your powder supplier or write for literature

COAST MANUFACTURING & SUPPLY CO.
LIVERMORE CALIFORNIA

COMPLETE RANGE OF TIMKEN BEARING BLOCKS FOR MINING

Skookum #708S mining block with swivel hook or regular shackle; 8" manganese sheave; safe working load 4000 lbs.; 5-to-1 safety factor. Can be equipped with sandseals.

SKOOKUM manufactures a series of lightweight, medium and heavyweight general purpose blocks particularly suitable for mining. 4" to 18" sheave diameter, or to fit your requirements. For line sizes from 3/8" to 1 1/8". Hadfield manganese steel sheaves, forged alloy steel yokes and draw pins, stress-proof steel sheave pins; may be had with line guards.

Skookum Will Build Anything in Blocks, Fairleads, or Forgings

WRITE FOR THE NEW SKOOKUM CATALOG ON MINING BLOCKS, both slusher and general purpose. Skookum will be glad to include name of your nearest dealer.

The SKOOKUM-CO., Inc.
8524 N. CRAWFORD, PORTLAND, OREGON U.S.A. • 647 TERMINAL AVE., VANCOUVER, B. C. CANADA

Multi-Purpose METAL BUILDINGS

Columbian All-Metal Buildings are ideal for *warehouses, engine houses, dry-houses, shops, garages, pump houses, compressor houses.* Precision fabricated from steel of sectional or rigid frame construction for domestic installation. Rigid frame design completely K. D. for export.

MASTER-CRAFTED BY COLUMBIAN

• Weathertight • Lowest Maintenance • Fire-Safe
• Easily Erected • Rigid, strong, long-lasting

Order from Distributor

United States **Denver Equipment Co.**, 1400 17th Street, Denver, Colorado — **Eimco Corp.**, 34 South 4th West Street, Salt Lake City, Utah

Outside U.S. **General Supply Co., S.A.**, Vallarto No. 1 Edificio Alberto, Mexico 4, D.F., Mexico

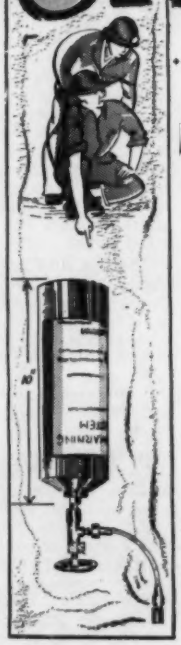
for illustrated descriptive literature, write to:

COLUMBIAN STEEL TANK CO.
Reg. U.S. Pat. Off.
P. O. Box 4048-H Kansas City, Mo.

STINKS!

. . . but thank heavens.

INEXPENSIVE—EASY TO INSTALL
SELF-INJECTING
MINE WARNING SYSTEM*



It stinks but thank heavens . . . many mineworkers, maybe you, would be saved by this mine stench warning system.

A distinct odor set off from the cartridge warns all the workers in the mine, no matter how isolated they may be from the rest that there is a fire or some other dangerous condition. With this system EVERYONE IS WARNED WITHIN MINUTES . Solid Protection.

Simple installation eliminates handmade apparatus often proved dangerous and inadequate. The system should be located where the temperature is between 70° F. and 110° F. and if the temperature is below 70° F., an enclosure can be constructed to house the cartridge with an electric light bulb.

The system, designed to be self-injecting into 110 lb. per square inch air line, consists of the steal stench cartridge, mounting bracket, puncturing valve, flexible tubing, and provision for making connection to the compressed-air main. The cartridge contains 100 grm. of ethyl mercaptan purified and 600 grm. of Freon 22 which renders the mixture non-explosive, as proved by United States Bureau of Mine tests.

Stench Cartridge ($35.00), Installation Kit ($11.40) F.O.B. Los Angeles, Calif.
produced by

Reed Engineering Co.
2054 West Slauson Ave. Los Angeles 47, California

*Patent Pending

good progress. The melt shop, to be used for melting titanium sponge into ingots, is expected to be in operation by August 1. The research building also is expected to be ready for work sometime in August. Acid storage facilities have been increased, and a new two-story administration building is to be completed in September. Additional railroad tracks will be installed. By the end of this year, anticipated production of titanium ingots is expected to reach 30 tons per day. The firm is owned jointly by *National Lead Company* and *Allegheny Ludlum Corporation*.

Failure of congress to provide additional funds for the purchase of tungsten for the national stockpile has caused cutbacks in operations at *Nevada-Massachusetts Company* and *Getchell Mines, Inc.* The Nevada-Massachusetts operates a large mine at Tungsten, Nevada. Getchell's property is at Getchell, Nevada about 25 miles northeast of Golconda.

Flexiform Engineering and Mining Company, Inc. has completed an agreement with *Eureka Hamburg Mining Company* under which Flexiform will develop all of Eureka Hamburg's mining properties on a royalty basis. This includes property on Prospect Mountain in the Eureka mining district of Nevada, and the *Uncle Sam* mine, a former gold-silver-lead producer. In 1923 Eureka Hamburg split its holdings and sold the *Hamburg* and *Southern Pacific* properties, originally part of the *Eureka Uncle Sam Consolidated* mine, to Dr. Seager of Laguna Beach, California. Flexiform has now obtained these two patented properties. All three properties will be worked through the Uncle Sam mine tunnel, since it is the only access to them.

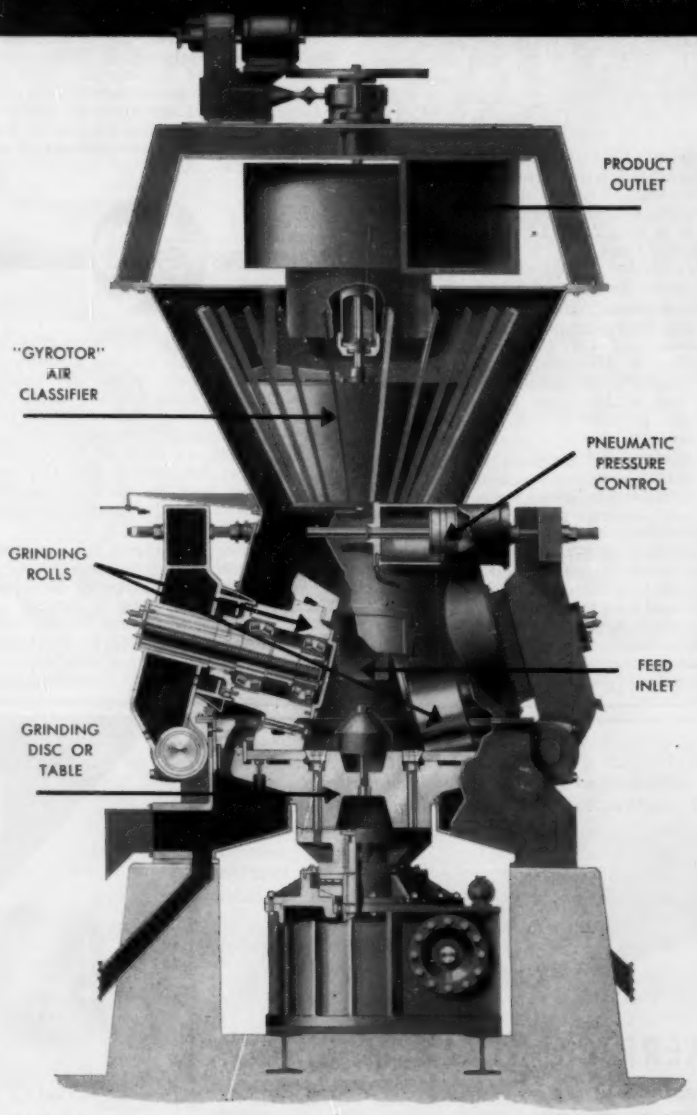
A receiver has been appointed by the Federal District Court to handle transactions of the *Copper Canyon Mining Company*. The *Reconstruction Finance Corporation* was awarded a judgment of foreclosure against the mining company and *Battle Mountain Copper Company* for non-payment of a loan granted by RFC several years ago. The extent to which future leases will be granted has not been determined. Persons already leasing will have new leases with the receiver.

Rowe and Austin have been shipping iron ore from their property near Jungo, Humboldt County, Nevada. The ore is trucked 36 miles to the *Western Pacific Railroad* siding for shipment to furnaces in the east.

Apex Uranium, Inc., reports it has located coffenite ore in diamond drill holes on its property near Austin, Nevada. The firm now believes that the autunite showings on the upper levels were oxidized portions of a larger coffenite ore body. Drilling is continuing.

Homestake-Sapin Partners' new contract with the AEC calls for construction of a mill with a daily capacity of 1,500 tons, and for sale to the AEC over a period of years of up to 11,173,200 pounds of uranium concentrate or "yellow cake." The ore will come from three sections of property held by Sabre-Pinon in the uranium district of Ambrosia Lake.

DISC-ROLL MILL



The Hardinge Disc-Roll Mill is a roller-type mill with two adjustable, pneumatically loaded rolls for grinding material on a horizontal rotating disc or table (Loesche type). The Hardinge "Gyrotor" Air Classifier, in combination with the mill, provides a complete grinding, classifying, and drying system. A full description is given in Bulletin 52-3.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA · 240 Arch St. · Main Office and Works

New York · Toronto · Chicago · Hibbing · Houston · Salt Lake City · San Francisco

Sabre-Pinon and *Homestake* have formed the partnership.

A new uranium operation has started in Sandoval County, New Mexico. E. H. Collins of Amarillo, Texas is developing the *Collins* open-pit mine, located about two miles north of Warm Springs in Sec. 25, T. 17 N., R. 1 W. Test shipments have been made and the operator is carrying out a drilling program to block out the ore body. The lease is on the Ojo Del Espiritu Santo Grant.

Superior Oil Company has started drilling as agreed in the farmout arrangements made with *United Western Minerals Company* and its partners. Current drilling is in Sec. 2, T. 14 N., R. 11 W, in McKinley County, New Mexico. The contract calls for a total of 250,000 feet of hole in this section and others.

Development mining is underway in the *San Pedro* copper mine of *Mercury Uranium and Oil Company*, 35 miles northeast of Albuquerque, New Mexico. The company has installed 1,000 feet of steel rail in the Swan Tunnel which is the main passageway into the mine from the south.

According to "Uranium Information," the AEC may pay as much as $300,000,000 to $350,000,000 under terms of the contract recently signed with *Kermac Nuclear Fuels Corporation*. The contract extends through 1966. The figure is based on an estimate of 40,000,000 to 46,000,000 pounds of uranium oxide being produced and sold to the commission during this period. Kermac is a joint operation of *Kerr-McGee Oil Industries, Pacific Uranium*, and *Anderson Development Corporation*.

Copies of "The Metal Resources of New Mexico and Their Economic Features Through 1954," by Eugene Carter Anderson are now available from the State Bureau of Mines and Mineral Resources at Socorro, New Mexico for $2.50. This is Bulletin No. 39, a revision of Bulletin No. 7 released in 1932, plus an accumulation of information pertaining to the metal mining industry in New Mexico from 1932 through 1954. It should be of particular interest to those concerned about the metalliferous deposits of the state.

General Services Administration has been receiving bids for the government-owned magnesium plant at Velasco, Texas. Bidders were *Velasco Magnesium Corporation* with an offer of $16,000,000 and *Dow Chemical Company* of Midland, Michigan with an offer of $19,370,000. It appears at this writing that Dow will get the plant since the other bid has been rejected. Dow already operates the plant under lease.

Fifty carloads of crude talc are being shipped monthly from the open-pit mines of *Southwest Talc Company* of Llano, Texas. The mining area is located between Van Horn and Sierra Blanca; three of the mines are operated by Southwest Talc, and the other by *Dallas Ceramic Company*. The Stafford brothers—John, Carl, and George, do the mining under contract.

U.S. Bureau of Mines researchers are reported to have developed, on a laboratory scale, four possible methods for recovering tin and tungsten from slags at the Longhorn tin smelter at Texas City, Texas. If further research shows that any of these methods are economically feasible on a large scale, the way will be opened to recover several million pounds of these metals from stockpiled slags at Texas City. Government operation of the smelter ended on February 15, 1957 when the smelter was sold to *Wah Chang Corporation*.

American Smelting and Refining Company expects its new mineral dressing and research laboratory to be completed at El Paso, Texas by the middle of this year. Also under construction is a new assay control laboratory. Both are for use in the Mining Department. Last year, ASARCO moved the western research section from Salt Lake City to El Paso, where a new and larger lab has been erected adjacent to the El Paso smelter to study nonferrous metals. Facilities for recovery of germanium from byproducts using a process development by the Research Department were built at El Paso last year and are being successfully operated.

Kiva Explorations Inc. has been formed in Austin, Texas to engage in development and use of geophysical techniques in seeking oil, gas, and metallic minerals. A method based on soil-chemistry principles of detecting uranium deposits at depths up to 750 feet will be offered by the firm. H. H. Dinkins, Jr. is president.

FEEDOWEIGHT

A self-contained conveyor feeder scale that feeds, weighs and totalizes. Use the Feedoweight for better control of ball mill grinding. It accurately controls FEED by WEIGHT automatically. Made in sizes to meet all tonnage requirements.

MERRICK SCALE MFG. CO.

PASSAIC 180 Autumn Street NEW JERSEY

CHANGE OF ADDRESS

CIRCULATION DEPARTMENT

MINING WORLD with which is combined the Mining Journal
500 Howard St., San Francisco 5, Calif.

Please change the address of my Mining World subscription

NAME .....

OLD ADDRESS .....

NEW TITLE OF POSITION .....

NEW ADDRESS .....

NEW COMPANY CONNECTION .....

Since 1908 . . .

DIAMOND DRILL BITS

for exploration and prospecting.

choose the **RIGHT MATRIX HARDNESS for YOUR JOB!**

- ASCOLITE bits .. 55 to 60° hardness
- NICOLITE bits .. 40 to 45° hardness
- BRONZOLITE bits .. 18 to 24° hardness

° on Rockwell "C" scale

POWDERED METAL

Special tungsten alloy powdered metal matrix to meet all drilling conditions. Bit crowns *sintered* onto blank bits in one operation.

Drill bortz and cast in all sizes and prices. Brazilian ballas and carbons. ASCOLITE reaming shells. Etc.

Price catalog on request

EST'D 1908

ANTON Smit & CO. INC.

111 Eighth Ave., New York 11
Cables: PROFITABLE, New York

Shaft Sinking Underway At Canadian Potash Mine

International Minerals and Chemical Corporation, one of the largest producers of potash in the United States, has started shaft sinking operations for a new potash mine near Esterhazy, Saskatchewan, Canada, about 150 miles east of Regina. The company controls 450,000 acres under permits in the area.

The company's potash mine near Carlsbad, New Mexico, one of the two largest potash mines in the United States, has been operating at capacity in recent years, supplying about 20 percent of the potash products used in the United States. The new Canadian project will take care of the company's expanding business, according to Louis Ware, president of IMC and its subsidiary, International Minerals and Chemical Corporation, (Canada) Ltd.

The Canadian property has been thoroughly drilled and ore proves to be of higher grade than that in New Mexico. It is 3,000 feet below the surface and its occurrence and the character of the ore bed, which is practically horizontal, favor mining it in a manner similar to Carlsbad. The area reportedly contains ample reserves for a mine that will produce at more than twice the rate of the Carlsbad mine.

The site of the new mine is closer to the market than other potash discoveries in Canada, and the potash can be shipped at favorable freight rates to United States and foreign consumers.

The contract for sinking of the mine shaft and constructing several surface structures has been let to Utah Construction Company of San Francisco, California, and work will be rushed to complete the buildings before the end of the short summer period. Merton I. Signer, IMC's resident manager, will supervise the construction.

International's other Canadian operations include a plant at Blue Mountain, Ontario, producing nepheline syenite, a raw material used in glass and ceramic manufacturing, and a feldspar mine 40 miles east of Ottawa. At its Niagara Falls, New York plant, IMC processes raw potash into potassium chemicals.

Largest Quicksilver Firm To Install Two New Kilns

Monte Amiata Company, largest Italian quicksilver producer and also the world's largest, will install two additional Gould horizontal rotary kilns for the continuous treatment of low-grade ore at the Abbadia San Salvatore mine, 100 miles north of Rome. The two new kilns will be built in Italy and are the same as the two original furnaces built in the United States by Gordon I. Gould & Company, of San Francisco.

The kilns are 5 feet 6 inches in diameter by 90 feet long and treat 150 metric tons daily each. When the new kilns are ready for use, the total Monte Amiata treatment section will include a 32-unit Pit furnace, with a 200-metric-ton daily capacity, which treats the coarse ore; six 50-ton Cermak-Spirex furnaces for the fine; and the four Gould rotaries for in between size ore. The present capacity is 800 metric tons per day, and the two new kilns will boost it to 1,100 tons daily.

The mine is shifting to greater mechanization, with the use of shaker conveyors and haulage equipment, because of the present lower grade ore being mined. Abbadia San Salvatore produced 40,000 flasks of quicksilver last year, making it the world's largest producer.

Record Commonwealth Congress in September

The Sixth Commonwealth Mining and Metallurgical Congress already is assured of a record crowd for its series of meetings and tours to Canadian mining districts in September. The meetings will start in Vancouver, British Columbia on September 8 and end in Halifax, Nova Scotia on October 9. During the interval all of the most important mines, metallurgical plants, and refineries from the Thetford asbestos mines to the Kimberley zinc refinery will be visited. Special chartered air planes and trains will be used to transport the delegates.

Reservations are on a "waiting list only" basis for the Northern Aerial Tour and the Combined Air-Rail Tour which extends from coast-to-coast. Accommodations are available on the Trans-Canadian All-Rail Tour, the Knob Lake Aerial Radius Trip, and the Newfoundland Aerial Radius Trip. Please contact the secretary, 507-837 West Hastings Street, Vancouver 1, British Columbia for information.

United States Company To Advise Bolivian Mining

The Bolivian government mining agency, Corporación Minera de Bolivia, operator of the nationalized mines, is seeking technical assistance from Ford, Bacon & Davis, Inc., a United States firm. This firm recently completed its study and reported on the state of mining in Bolivia and pointed out many deficiencies that should be remedied.

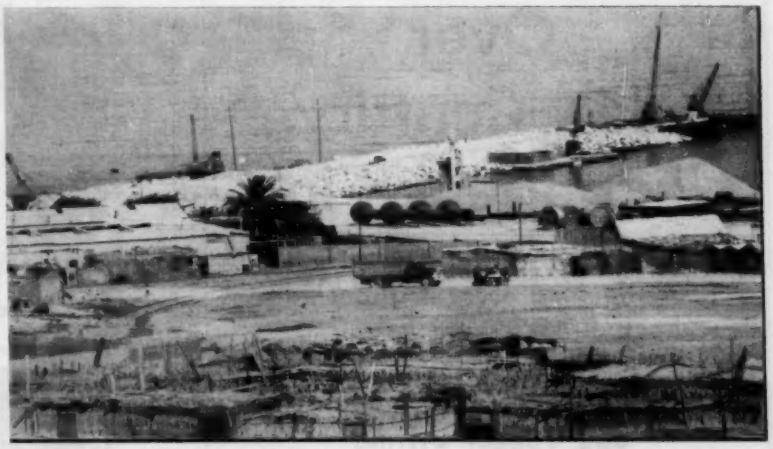
The technical assistance will be for the Colquiri, Huanuni, and Catavi mines and will be in three parts: first, selection of better equipment; second, establishment of a consulting geologist to supervise ore reserve studies and determine means to increase reserves; and third, establishment of better mining method with the special object of more selective mining to yield higher grade ores.

The Corporación has designated the following engineers from its staff to assist with the program—metallurgy: Boris Luvinsky, Oscar Dávila, Carlos Antezana, and Humberto Vásquez; mining: José Rosas, Lucio Vega, and Lusi Tapia; geology: Gustavo Donoso.

Hawaii's Bauxite Deposits Draw Many Geologists

Geologists from the major aluminum companies, and from leading non-ferrous companies as well, are busy on the Hawaiian Islands evaluating Hawaiian soils for their bauxite content.

High bauxite areas have been found on Kauai, Maui, and Hawaii along the northeast coasts where rainfall is the heaviest. Gibbsite, Al $(OH)_3$, has been identified as the principal mineral. It occurs as concreations irregularly scattered throughout the soil, occasionally to depths of 30 feet. Most areas are relatively low grade in point of total gibbsite so some method of upgrading or

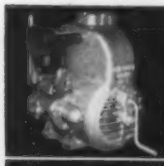


Southern Peru Copper Builds Pier at Ilo

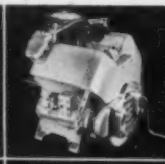
Construction of a large pier for unloading ocean-going ships is well advanced at the port of Ilo in southern Peru. Southern Peru Copper Company is rushing this construction as the open port has no dockage facilities for large ships and many tens of thousands of tons of supplies and equipment must be unloaded for construction of the Toquepalla flotation concentrator, the smelter north of Ilo, power plants, and other necessary facilities. After smelting starts, blister copper will be loaded from this pier. Preliminary road, power plant, and mine equipment now in use have all been lightered ashore. Pier construction is contracted to Foley Hermandos, S.A., Peruana (Foley Brothers). As the picture shows, the rock fill at the shore end has been completed and the 600 feet of pier started. Hollow steel caissons are sunk to bedrock and then filled with concrete to form legs for the pier. Four of these are shown onshore in the center of the picture. Concrete caps will connect the legs; the concrete batching plant is above the caissons and the aggregate piles are to the right. Morrison-Knudsen Company is building the railroad from Ilo to the mine at Toquepalla and north along the coast to the smelter site about seven miles from the port. Railroad construction along the coast and to the mine is difficult as the line runs along a sand desert facing the sea so drifting sand is a constant problem.

THE BIG 4 IN DIESEL POWER

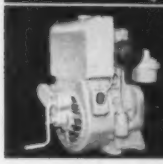
AMERICAN MARC Inc. dominates the field of lightweight, low-horsepower Diesels by building its diversified line from the "Big Four" basic models illustrated here. Purchase and maintenance of engines and parts are simplified by the use of these compact and rugged prime movers.



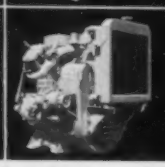
AC1: Air-cooled, one-cylinder, four-cycle 6.5 BHP at 1800 RPM.



AC2: Air-cooled, two-cylinder, four-cycle v-type, 14 BHP at 1800 RPM.



WC1: Water-cooled, one-cylinder, four-cycle, 7 BHP at 1800 RPM.



WC2: Water-cooled, two-cylinder, four-cycle v-type, 15 BHP at 1800 RPM.

AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 4 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

SOME DESIRABLE SALES TERRITORIES ARE STILL OPEN.
INQUIRIES ARE INVITED FROM REPRESENTATIVE DEALERS.

AMERICAN MARC INC.
DIESEL ENGINES

1601 West Florence Ave.
Telephone OR 8-7174

Dept. MW-67
Inglewood, Calif.

AMERICA'S LARGEST MANUFACTURER OF AIR-COOLED DIESELS

Over Half Century Experience in

Exploration and Development
Diamond Core Drilling
Rock Breaking — Grouting
Shaft Sinking
Mining — Quarrying
and Tunnel Driving

Full details on request

Bovles Bros.
DRILLING COMPANY

1321 South Main St. • Dial HUnter 4-4401
Salt Lake City, Utah

Spokane, Washington	Telephone KE 4-0862 and WA 4-2614
Leadville, Colorado	Telephone 443-W
Phoenix, Arizona	Telephone CRestwood 4-5331
Monticello, Utah	Telephone 9381 and 9184
Reno, Nevada	Telephone FAirview 9-0732
Denver, Colorado	Telephone WEst 4-0673
Alaska	Contact Salt Lake City Office

PACIFIC FURNACE

MULTIPLE HEARTH FURNACE

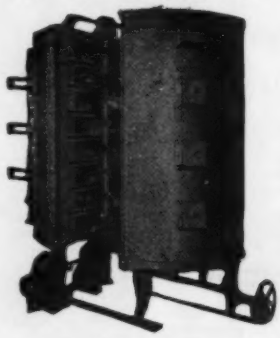
ROASTING CALCINING DRYING

ZINC ORES	QUICKSILVER
IRON ORES	MAGNESITE
COPPER ORES	LIMESTONE
TIN ORES	MOLYBDENUM
NICKEL ORES	BONE CHAR
LEAD ORES	DIATOMITE
SODA ASHES	LIME SLUDGE
FULLERS EARTH	MAGNESIUM
CARBON	CLAY GRANULES
PYRITE	ANTIMONY

SELENIUM
SEWAGE SLUDGE
LEAD CHEMICALS
METALLIC SLUDGES
FILTERING MEDIA

And for Numerous Other Materials

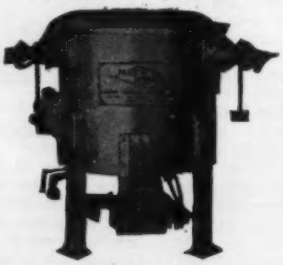
SIZES 8' 6" TO 22' 3" DIAMETER
NUMBER OF HEARTHS, 1-16



Pacific Laboratory Furnace

PACIFIC LABORATORY FURNACE

Manufactured in two sizes—36" and 54" inside diameters having 6-8-10 Hearths and include the same features as the commercial size furnace.



Pacific Furnacing Unit

NEW PACIFIC FURNACING UNIT

Higher shell height. Three gas burners. Provision for conversion to muffle unit. Small volume roasts at any desired temperature.

PACIFIC FOUNDRY COMPANY LTD.
Engineers and Metallurgists

1400 So. Alameda St.
Los Angeles

3100 19th St.
San Francisco

551 Fifth Ave.
New York

beneficiation would be necessary to make a marketable concentrate.

Hawaii offers the advantage of a favorable economic and governmental climate, and shipping to the United States presents no problems. There is, too, the chance that additional geological mapping and sampling will disclose deposits that can be mined and shipped without concentration.

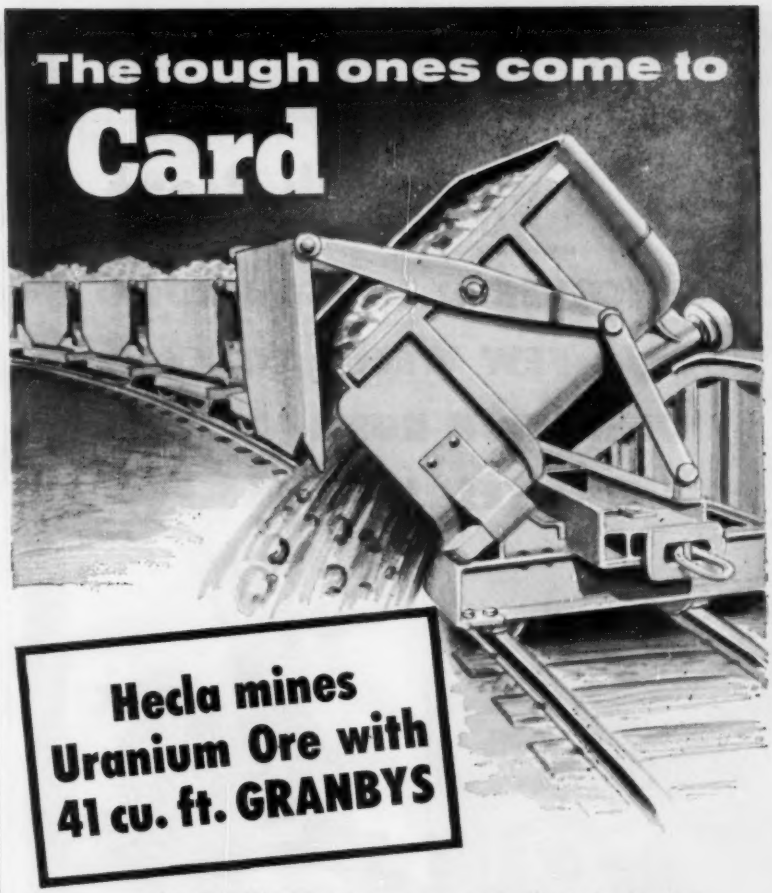
SWEDEN—A large iron ore deposit has been located at a depth of 1,500 to 3,000 feet by aeromagnetic surveying near the Bispbergs mine at Saeter, in central Sweden. The newly discovered ore body is close enough to the old mine that a cross cut has been driven into it from one of the old shafts. The exact size of the deposit has not been determined, but it will substantially extend the life of the Bispbergs mine.

ENGLAND—It is expected that it will be possible to enter the *Roskear* circular shaft workings from the *South Crofty* mine, on the property of *South Crofty Ltd.*, sometime during 1957. This should not only improve ventilation but begin to render the extensive Roskear section available for detailed examination. As reported in MINING WORLD (July 1956, page 77), existing reserves above the 2,040-foot level on lodes from No. 4 lode southward are sufficient to maintain production for the next few years. After that, future ore supplies must be looked for by developing westward in virgin ground between the South Crofty and Roskear shafts.

U.S.S.R.—*Pravda* recently reported, in an article on geological research in the Soviet Union, that recent discoveries include "extremely interesting" wolframite and molybdenum ore bodies in central Kazakhstan. Substantial tin deposits have been found in the Pacific coast region near Khabarovsk and in Yakutia, larger than those now being developed anywhere in the Soviet Union. Large copper deposits are said to have been discovered near Udakan as well as molybdenum deposits near Borzya, both in the Tchita district of Siberia, east of Lake Baikal. Copper ores are being mined by open-pit methods in the Djezkargan area of Kazakhstan, and a copper refinery will be built near-by. There is, however, one copper plant at Djezkazgan already.

NORWAY—*Titania* A/S, at Sogndal in southern Norway, has been granted a government concession to mine the 350,000,000-ton deposit of ilmenite at Telnes, which was found by aeromagnetic surveying in 1955. The company, a subsidiary of *National Lead Company*, will invest 75,000,000 kroner (about $10,000,000) in open-pit equipment and mill installations to mine and process the low-grade ore. Production will start in 1960 at a rate of about 300,000 tons of ilmenite concentrate from 1,000,000 tons of crude ore per year. The ore will be crushed and ground at the mine, then pumped three miles to the separation plant at the company's harbor at Joessingfjord. Work has started on a three-mile tunnel to drain a lake which partly covers the deposit.

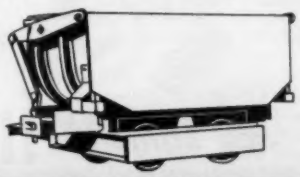
SPAIN—A contract has been awarded to *Hunting Geophysics Ltd.* to fly a com-



Hecla Mining Company opened their Radon property with 20 small Granby-type Card cars designed specifically for this underground service. Hecla is operating one of the deepest uranium mines in the U.S.A. with a well planned mine plant.

The underground haulage involves up to 300 tons per day of 0.7 percent U_3O_8 ore. Each Card Granby car has a capacity of 41 cu. ft. and is built on 24" gauge. When the Radon orebody is exhausted, the cars will still be able to "outlive" another Hecla mine of comparable size without major repair or replacement.

Such haulage efficiency and long life are yours whenever your choice is Card. Our engineers are at your service on any production haulage problem.



C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO

AT GRAHAM BROS. CATALINA QUARRY

one intelli-Giant

UNCOVERED ENOUGH ROCK IN A FEW WEEKS TO KEEP OPERATION RUNNING A FULL YEAR!

"Excellent performance record," reports Graham Bros., even though their Intelli-Giant uses corrosive salt water from the nearby Pacific Ocean.

To mine a very steep bank, Graham Bros. first had to remove several feet of clay-laden soil, loaded with large boulders and thick brush growth. An Intelli-Giant was secured and set to work.

Operating at 160 psi and 850 gpm, the Intelli-Giant washed away burden and undercut boulders with such speed that in a few weeks enough rock had been uncovered to keep the operation running for a full year.

Interested in speeding up your quarrying operation? Then by all means investigate the Chiksan Intelli-Giant.

For more information write Dept. 237

CHIKSAN

fmc CHIKSAN intelli-Giant

CHIKSAN COMPANY • *Subsidiary of Food Machinery and Chemical Corporation*
Brea, California • Chicago 3, Illinois • Newark 2, New Jersey
Well Equipment Mfg. Corp. (Division) Houston 1, Texas • Chiksan Export Company, Brea, Calif.; Newark 2, New Jersey, Chiksan of Canada Ltd., Edmonton, Alta.

bined magnetometer, scintillation counter, and two-frequency electromagnetometer survey in the Huelva district to search for sulphide ore and associated mineral deposits. It will be flown on close traverses at an altitude of 500 feet.

NORWAY—The Canadian company, *Invex Corporation Ltd.*, will investigate the old copper deposits at Rapparfjord in the northernmost part of Norway this summer. A large-scale diamond drilling program will be inaugurated to determine whether extensive mining operations would be profitable. Ownership of the deposit is in Swedish hands, but the property has not been worked for over 50 years and never on a large scale.

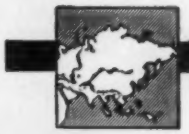
NORWAY—Plans are underway for *Rana Gruber A/S* at Mo i Rana in north central Norway to build a pilot plant at a cost of about 8,000,000 kroner (about $1,000,000) for development of a suitable ore dressing method for its extensive deposits of low-grade hematite-magnetite ore in the Dunderland valley north of Mo. The plant will have a capacity of 10 tons per hour.

EIRE—With a complete mining plant now fully installed at the *Mountain* mine of the Bearhaven or "Hungry Hill" group in the Allihies concession in west County Cork, Ireland, *Can-Erin Mines Limited* expects to be mining underground by mid-summer.

ITALY—The *Montecatini Company* produced 16,500 tons of lead during 1956 and 18,500 tons of zinc. Bauxite production decreased from 260,000 tons in 1955 to 238,100 tons in 1956. Aluminum output was 36,640 tons; pyrite, 1,200,000 tons; and sulphur declined to 25,983 tons. The *Sorin Company*, formed jointly by Montecatini and *FIAT*, will construct a nuclear reactor and research laboratory.

BULGARIA—Soviet experts have visited the *Krdjali* lead-zinc works with the view of making plans to double the lead and cadmium output and quadrupling the zinc and sulphuric acid production by 1958.

HUNGARY—Bauxite output has been estimated at 1,000,000 tons in 1956, and is predicted to total 900,000 tons in 1957, according to reports from Budapest. Including the present reserves of ore on hand, exports will reach about 1,050,000 tons in 1957.



JAPAN—*Ishihara Industrial Company Ltd.*, a major titanium oxide producer in Japan, has completed expansion of its plant at Yokkaichi in Nagoya Prefecture on the island of Honshu. Production capacity of titanium oxide has now been increased from 1,000 tons monthly to 2,000 tons monthly. The plant is in full operation with parallel circuits, one treating rutile and the other anatase (TiO_2).

INDIA—The Government of India has approved a proposal by Dr. S. P. Choudhuri for setting up a plant to process ilmenite sand deposits on the Arabian Sea coast in the Ratnagiri district, south of Bombay. Developments are in progress.

MALAYA—*Pacific Tin Consolidated Corporation* has made arrangements to exchange its idle *Kota Bharu* dredge for

one of larger capacity from California. The latter will have to be converted from gold operations to handling of tin gravel. The reconditioned dredge will weigh over 3,500 tons and is designed to have a productive capacity of more than 500,000 cubic yards per month, or about 25 percent greater than the Kota Bharu dredge.

NORTH KOREA—Under a recently completed agreement with the Soviet Union, North Korea will increase the amount of metals and ores it will send the Union in return for industrial equipment and other materials in 1957.

TURKEY—The *M.T.A. Institute* is continuing underground exploration and diamond drilling on the *Israil, Lahanos,* and *Harkkoy* copper-pyrite deposits at Tirebolu, province of Giresun, on the Black Sea coast. These deposits have a long history. They were once exploited by the Genoeses. At one time, an English firm did mining work in the district. The M.T.A. Institute carried out explorations there in 1937 and 1947. The *Newmont Mining Company* inspected them not too long ago. Additional exploration was done by M.T.A. Institute in 1956, including 350 meters of drifting and 1,200 meters of diamond drilling.

MALAYA—A local Chinese mining syndicate, reportedly called *New Lahat Mines Ltd.*, is said to have been granted permission to prospect on the town site of Lahat. The town is believed to stand on a rich tin deposit estimated to contain 16,000 piculs valued at about $5,-500,000. Residents of the town are expected to move to Ipoh, Menglembu, or other nearby villages.

BURMA—*Hunting Aerial Surveys* reports that it has a contract to perform an airborne geophysical survey of southern Burma where there are indications of iron ore and radioactive deposits. The area consists of sediments intruded by granite. Alluvial tin mining is carried out in this part of Burma, and it has been noted that the alluvials contain thorium and uranium. It is hoped by airborne radiometric traversing to indicate the pegmatites which are the probable source of the alluvials, and by combination of magnetometer and radiometric traversing to outline the contact of the granite with the country rock, a likely source of mineralization.

MALAYA—*Sungei Besi Mines* operating near Kualal Lumpur are reported to be cutting back production because of a shortage of mining and dumping ground. The mines employ more than 500 workers, many of whom are already being pensioned or dismissed.

TURKEY—Chrome ore production from the famous Fethiye district in southern Turkey totaled about 170,000 tons during 1956. Largest producer was the *Turk Maadin Company* with an output of 70,000 tons. *Sitki Kocman Company* produced 50,000 tons, a French firm 25,000 tons, and the remainder was produced by small companies.

WEST PAKISTAN—Rules and regulations are being prepared by the West Pakistan government for supervision of the mining industry. The provincial government has been consulting with the central government on the pattern of these local regulations. The provincial group is extremely anxious to encourage mining in West Pakistan and recently set up a *Mineral Development Corporation* for this purpose.

INDIA—Steps are being taken to conserve manganese ore, one of India's principal foreign exchange earners which accounts for Rupees 20 crores of the Rupees 38 crores earned annually by export of minerals. Madhya Pradesh state produces about 70 percent of this total. The National Metallurgical Laboratory has been studying the best methods for conservation for the past six years and has conducted experiments on the improvement of low-grade ore. Besides ore dressing work, the lab has also conducted investigations on thermal beneficiation and the production of electrolytic manganese and electrolytic manganese dioxide.

MALAYA—The *Temangan* iron ore mines will make their first trial shipment of 10,000 tons to Japan in October. The ore will be loaded aboard the Nissei Maru, one of the ore carriers of the *Nissan Kisen Kaisha Ltd.* Operations at Tumpat in Kota Bharu started in 1956; the company has been formed in the previous year by *Messrs. Andrew Weir & Company, Ltd., Messrs. Boustead & Company Ltd.,* and *Kokan Kogyo Company.*

INDIA—The Geological Survey of India has located deposits of talc, iron ore, and kaolin in the Keonjhargarh district of Orissa state. The talc, reportedly with 50 percent silica content, is scattered over four areas. The large deposits of iron ore are noted southwest of Suakati, north-northeast of Upar Jagar, and Ichanda, while the kaolin is found in several places around Keonjhargarh and in a zone extending over one mile west of Keojhargarh.

REPUBLIC OF THE PHILIPPINES—The new 4,000-ton copper mill of *Marinduque Iron Mines Inc.* has gone into operation at Sipalay, Occidental Negros. The company expects to make a net production of 1,670,000 pounds of copper per month of 26 working days, or about 20,000,000 pounds annually, by milling 1.0 percent copper ore and assuming 80 percent recovery from the mill and 95 percent from the smelter. The company is continuing exploration and development work at the *Sipalay* properties. Plans are underway to erect a copper concentrator at Bagacay, Samar. The firm also plans a sulphuric acid and copper smelting plant there.

NORTHERN TERRITORY — *United Uranium N.L., King Island Scheelite N.L.,* and *Loloma (Fiji) Gold Mines N.L.* have formed a joint prospecting company with authority to prospect the *Maranboy* tin fields about 40 miles from Katherine in the Northern Territory. This has long been regarded as one of Australia's most important tin-bearing areas, but a number of different interests have held titles to the area, thus retarding development. Options have now been acquired over all of the principal leases and mines.

FIJI ISLANDS—*Emperor Gold Mines Ltd.* at Vatkuola is continuing its development program and prospects appear favorable. The Legislative Council of Fiji is to discuss a government proposal to exempt from tax for up to five years the associated companies that have worked *Emperior, Loloma,* and *Dolphin* mines. The five-year capital expenditure program on the Emperor mine will cost £ Fiji 930,000.

REPUBLIC OF THE PHILIPPINES—*Palawan Quicksilver Mines* has definitely decided to add a third kiln to its furnacing plant on Palawan Island, where two 80-ton Gould furnaces are already in operation. In March the plant treated 4,511 tons of cinnabar ore to recover 22,099.17 pounds of mercury. The company is also installing a type "D" retort to process the soot and settling tank residues that have a high concentration of mercury. Exploration and development work through diamond drilling and bench cuts is continuing with encouraging results.

TASMANIA — Favorable results continue from *Montana Silver-Lead N.L.* on the *Zeehan* property where copper-nickel ore averaging about 1.5 percent nickel has been discovered with high-grade ore ranging up to 8.0 percent nickel. Some rich ore lenses 1 to 10 feet wide are stated to be in dense nickel-copper sulphide assaying 8 to 14 percent nickel and 4 to 5 percent copper. These lenses can be mined and ore shipped overseas without beneficiation. Small-scale tests have shown that the company's concentrator can produce a marketable copper-nickel concentrate.

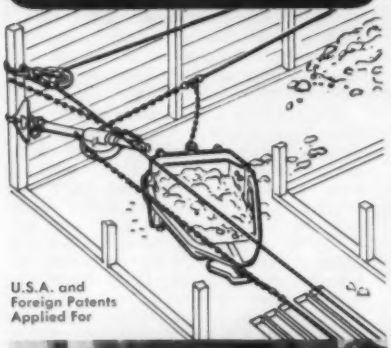
INDONESIA—The German firm of *Wedexro* reportedly has received a contract from the Indonesian government for the planning and designing of a complete tin smelter.

NORTHERN TERRITORY—*South Alligator Uranium N.L.,* operating at Rockhole, has announced that a winze down to 20 feet below the floor of No. 2 adit is in high-grade (4.5 percent U_3O_8) from 6 to 20 feet. The company is pushing ahead with work on other likely zones, such as the *Airstrip* anomaly, and hopes to be in profitable production within a year. Rockhole, El Sharana, and Saddle Ridge are three of several radioactive areas along the South Alligator fault.

REPUBLIC OF THE PHILIPPINES—*Philex Mining Corporation* is building roads into its chromite property on Palawan Island and hopes to start mining shortly. An estimated 50,000 tons of metallurgical grade ore has already been proven, and additional tonnages have been indicated. Consideration will be given to erection of a 100-ton mercury plant toward the end of the year at the firm's Palawan mercury property if reserves at that time seem to warrant it. Philex is also examining an iron deposit located southwest of Cagayan de Oro. A detailed mapping and sampling program is being carried on and a diamond drill rig will be moved onto the property when available. Approximately 250,000 tons of magnetite iron ore has already been developed with a grade of 60 percent Fe.

NORTHERN TERRITORY—The wet season has held up exploration by uranium companies and other mineral prospecting groups but it is now over. *United Uranium (Uranium Mines* and *Northern Uranium Development)* had part of its airstrip washed away by floods, while a number of roads were damaged. Due to various factors, *Australian Uranium Corporation N.L.* has closed its Adelaide River mine but plans to reopen it later. It is beginning to appear that United Uranium's deposit is the only worthwhile one (apart from *Rum Jungle*) in the

THE REDESIGNED
PACIFIC®
"R-T-C"
is practically infallible



U.S.A. and Foreign Patents Applied For

Let us send you Bulletin No. 259 which gives complete information on the redesigned Pacific "Round-The-Corner" Sheave Block with action pictures illustrating how it cuts costs wherever double slushing is employed.

ALLOY STEEL & METALS CO.

1848 E. 55th St., Los Angeles 58, Calif.
Mailing Address: Box 58323 Vernon Station, Los Angeles 58, California

Northern Territory. Nothing definite has emerged from *North Australian Uranium Corporation N.L.*, in which *Atlas Corporation* holds a major interest. *South Alligator Uranium* is still only a prospect. Others, of course, may be discovered.

REPUBLIC OF THE PHILIPPINES—*Benguet Consolidated Inc.* which is managing properties for *Consolidated Mines, Inc.*, reports that the company's properties are being further tested and drilled this year to develop larger tonnages of chrome ore. In Zambales, these prospects will be examined under Royalty Agreement: *Takipan-Bunuan* group; *Tal tal* group; *Masanay; Cabangan; Tapolao-Balococ; Candelaria-Collins; La-Yo-Ag;* and *Libmed*. The *Coto* mine, as of January 1, contained an estimated reserve of 4,362,800 long tons of mill feed, and alluvial below the mine contained float ore. The latter is to be further tested this year. Prospecting and exploration has also shown indications of chromite on the *Emerald Fraction, Murphy,* and *Hayden* claims. Diamond drilling and actual mining will be undertaken to ascertain the extent of this new development.

NEW GUINEA—*Bulolo Gold Dredging, Ltd.* is carrying on exploration work in New Guinea, Papua, and other areas of the southwest Pacific for gold and other metals. To date no commercially valuable deposits have been located. The company's No. 4 dredge will soon be permanently closed down as the reserves it is working are exhausted. This will leave No. 5 dredge as the only operating dredge for the firm. This one will continue in operation for several years since it will subsequently handle gravel reserves previously allocated to dredge No. 7 which sank in May 1956. With diminishing dredging operations, the company plans to increase the residual value of its remaining assets: power plants, machine shops, camp buildings, etc. Partly with this in view, the company entered into an agreement with Commonwealth Government of Australia to form the *Commonwealth-New Guinea Timbers Ltd.* The company recently agreed to purchase a new timber area adjacent to Lae in New Guinea.

REPUBLIC OF THE PHILIPPINES—*Pitkeel Mining Company* has signed agreements to operate two adjacent groups of claims on Marinduque Island. The mine reportedly contains lead-copper-zinc-gold-silver ore. It was partly developed before the war, and the new operators are reopening old tunnels, repairing roads, and undertaking extensive development work. Production is scheduled for the near future.

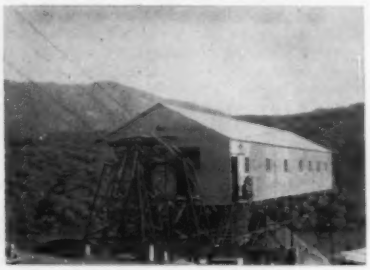
LATIN AMERICA

BOLIVIA—The government agency operating the confiscated tin mines of *Patino Mines & Enterprises Consolidated, Inc.* made payments of $263,568 to Patino during the first quarter of 1957, compared with $125,403 for the first quarter of 1956. The increased payments are due to the recent larger shipments of tin concentrate. Shipments amounted to 1,289 metric tons for the first two months of 1957, against 790 metric tons in the same period of 1956. Alexander B. Royce, vice president of Patino, stated that although conditions are improving slightly they are not too satisfactory. He commented in a letter to the stockholders: "It has been the view of our organization for some time, and it is now more than ever our opinion, that any grants and gifts to Bolivia should be conditioned upon satisfactory assurances that the Bolivian Government's obligation to the owners of the properties seized will be met, and that the existing default will be cured."

CUBA—According to *Ministry of Agriculture* figures, 72,808 tons of calcopyrite ore were extracted from the *Matahambre* mines during the first four months of 1957, and 12,853 tons of concentrate exported. During the same period, 504 tons of copper were produced and exported from the *Dora* mine by the *Compania Industrial Minera Dora, S.A.* Copper pyrites totalling 8,268 tons were shipped from the *Margot* mine to Rotterdam on April 2. Shipments of 6,501 tons of chrome ore from the *Lolita* mine were sent to Philadelphia, together with 71 tons of manganese ore from the *Bayamo* mine.

PERU—The *Antamina* copper property, 100 miles northwest of Cerro de Pasco, is now estimated by *Cerro de Pasco Corporation* to contain about 100,000,000 tons of 1.5 percent copper. A thorough exploration of the property will begin in the dry season next year. By 1959 Cerro de Pasco hopes to bring its refined copper output up to 340,000,000 pounds. Production in 1956 was 235,000,000 pounds, almost double the 1950 output of 123,000,000 pounds. Lead production plans

RIBLET
AERIAL TRAMWAYS



Reduce Transportation Costs!

Modern Riblet Aerial Tramways provide low cost hauling for minerals, wastes and other products over any terrain.

They run in straight lines over roads, rivers, swamps and valleys in all kinds of weather.

Write Dept. F-2 for Brochure

RIBLET TRAMWAY CO.
Box 7, Sta. A. Spokane, Washington
Since 1894

call for an output of 200,000,000 pounds by 1961.

CHILE—*Cerro de Pasco Corporation* is making further investigations at the *Rio Blanco* copper orebody, 32 miles northeast of Santiago. The Corporation's option to purchase the property from *Rio Blanco Copper Corporation* has been extended to October 1958. Reserves are now estimated at 85,000,000 tons of probable and prospective ore containing approximately 1.5 percent copper. A great handicap to development in the region is that the area is covered by snow about seven months of the year, leaving only five workable summer months.

MEXICO—*Compania de Azufre, Veracruz, S.A.*, subsidiary of *Gulf Sulphur Corporation*, has been granted permission by the government Mining Development Commission to assume control of a sulphur mining property formerly owned by *Pan American Exploration Company* of Mexico. The 7,000-acre concession is near Gulf Sulphur's own 7,500-acre property on the Isthmus of Tehuantepec. Under terms of the agreement with the government, Gulf Sulphur is required to drill at least 10 wells this year on the property, and another 10 in 1958. The company estimates reserves on its own property to be more than 13,000,000 long tons of sulphur.

PERU—Open-pit copper mining was begun on a small scale by *Cerro de Pasco Corporation* early this year at its *Cerro de Pasco* mine in the Central Peruvian Andes. This is the first time the corporation has employed power-shovel mining.

MEXICO—Exploration and development work is underway at the silver-lead-copper mine of *Compania Minera Matamoros S.A.*, 60 kilometers southwest of Matamoros, state of Puebla. Enriqur Gonzalez Monzori is acting as general manager.

BRAZIL—The lead deposits discovered in Buquira, district of Macaubas, state of Bahia, three years ago, are now considered to be the most promising in the country. Pure cerussite (lead carbonate) is found in layers of two meters width. The ore deposits are formed by parallel veins and their dimensions may be as great as three to four kilometers long. These deposits are in itabirite rocks (hematite quartzite) which also contain about 20 percent lead. Primary ore (galena) has already been found below the surface. The deposits will be studied carefully by Brazilian and United States geologists.

PERU—Iron ore from *Marcona Mining Company's* operations near the Port of San Juan was delivered to *Granite City Steel Company* at St. Louis, Missouri recently. It was the first foreign iron ore brought into that area, and was purchased to test its efficiency in Granite City's blast furnaces. The latter's regular supply comes from Iron Mountain in southeast Missouri, and from the Minnesota Iron Ranges. The Peruvian ore is a heavy dense magnetite; about 59 percent of its weight is iron. This is reportedly about seven percent higher than the domestic ore purchased.

MEXICO—The *Aurora* unit of *Cia. Minera ASARCO, S.A.* at Mineral de Xichu, Guanajuato, is reported to have informed its employees that it must close. Unprofitable operation caused by low ore prices is said to be the reason for the shutdown. State and municipal governments have indicated that they are

E. A. GODOY & CO., INC

CUNARD BUILDING, 25 BROADWAY

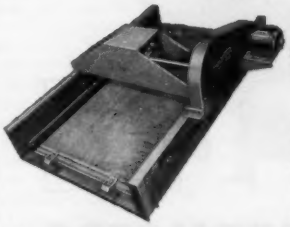
NEW YORK 4, N. Y.

GENERAL AGENTS

FOR

MINING COMPANIES

Unexcelled for
Fine Mesh Screening



For fast, efficient screening in the fine mesh range, the Leahy® No-Blind® Vibrating Screen is unique in its field.

Employing an exclusive differential vibration that snaps wedging particles loose 1600 times per minute, the screen may be operated on long- continuous schedules at top capacity. For full information send for Bulletin 15-J.

The DEISTER CONCENTRATOR CO. 925 Glasgow Ave., Fort Wayne, Indiana

get more earning power with...

Greensburg storage battery locomotives

5 TON HIGH TYPE MONITOR

Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. Advanced engineering design and custom-building to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

Built in single or double motor drives with double equalizers, drum or contactor type controllers, with or without dynamic braking, Greensburg Locomotives will haul more and cost less to operate!

Send us your haulage problem today!

GREENSBURG MACHINE CO. 110 STANTON STREET GREENSBURG, PA.

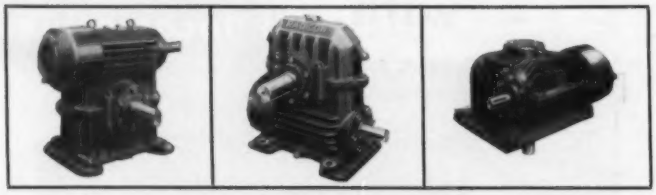
Filter Drives • Agitators • Screens • Thickeners
Classifiers • Conveyors • Sand Preparation Machines

RADICON

WORM GEAR REDUCERS

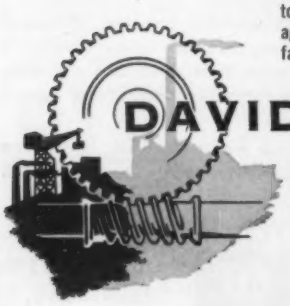
To many a mining operation, the speed reducer is an all-important unit. It must be efficient, rugged and reliable.

That's why fan-cooled Radicons, like the models below, are being specified by manufacturers of mining and process industries equipment. Within the past year hundreds of Radicons have been delivered—no waiting for the size or ratio desired—no trouble after installation!



Check Radicon's ability to withstand extremes of temperature, dust, dirt and rain—find out how a Radicon Speed Reducer can eliminate high initial cost and maintenance.

Immediate delivery RHU 3" to 12", RHO and RHU 4" to 12"—all standard ratios from 5:1 to 60:1. Packaged Drives supplied by authorized David Brown factory branches and distributors.



DAVID BROWN, INC.
999 Beecher Street, San Leandro, California
6025 Atlantic Boulevard, Maywood, California

RADICON . . .
Winner 1957
"Blue Ribbon" Mining Award

not interested in taking over the unit for its workers to run cooperatively.

PERU—Modifications to the electrothermic zinc plant of *Cerro de Pasco Corporation* have been virtually completed and it should go into operation at any time. The plant now has a capacity of 60 tons per day. The electrolytic zinc plant's capacity was expanded from 35 to 90 short tons per day last year and it is in operation. Copper production last year declined 1.6 percent from 1955. Totals were: 68,199,881 pounds in 1956, compared with 69,342,698 pounds in 1955. Production of refined lead was at the same level of the previous year—130,558,454 pounds in 1956, 130,450,181 in 1955. Output of refined zinc at 20,728,739 pounds was 45 percent below that of the preceding year (37,876,911) because of the closing of the zinc refinery to conserve power during the five months of the year.

MEXICO—Subsidies from the federal government to 1,200 small and medium-scale miners totaled more than $4,800,000 last year, according to the Mining Chamber. The government is now arranging to invest about $56,000,000 in mining, according to the same source. Stressing the importance of mining to Mexico, the Chamber reported that during the past 10 years mining products constituted an average of 36.6 percent of Mexico's exports.

NORTH AMERICA

BRITISH COLUMBIA—*Phelps Dodge Corporation* is reported to be negotiating with *Jericho Mines Ltd.* for the right to investigate a 1,000-claim copper-bearing group of mines held by Jericho in Highland Valley. A proposed agreement provides for a five-years lease that is cancellable by Jericho if Phelps Dodge fails to do any work from May to November of any year. If Phelps Dodge should decide to place the property in production, a new firm would be formed—*Anson Mines Ltd.*, in which Phelps Dodge would hold a 75 percent interest and Jericho 25 percent. Phelps Dodge would also have the right to purchase Jericho's interest on terms based on earnings of the initial three years of copper production.

ONTARIO—*M. A. Hanna Company* plans to reopen the *Moose Mountain* iron ore mine which was abandoned after World War I. The ghost town of Sellwood will not be rebuilt, however; a new subdivision is expected to be added at Capreol. Hanna reportedly will build an $8,000,000 mill for fine grinding and magnetic separation of the low-grade ore. A spur line is being constructed from the Canadian National Railway right of way to the mine site.

QUEBEC—*Quebec Iron and Titanium Corporation* is constructing three new furnaces in addition to the present five now in operation at Sorel. The first of the three new units should be in operation by November of this year; the others are scheduled for operations by the end of 1958. Enlargement of dock facilities at Havre St. Pierre is also under way to handle the increased amount of ore that will be required. *Kennecott Copper Cor-*

poration owns two-thirds of the firm, and *New Jersey Zinc Company* one-third.

NORTHWEST TERRITORIES—*Rayrock Mines Ltd.* has placed its new 150-ton mill in operation on a tune-up basis, and expects to have it operating at full capacity within a few months. During this period the uranium mill will be operating on stockpiling ore, until the mine is able to supply to 135 to 150 tons planned for daily handling.

ALASKA—*Columbia Iron Mining Company*, a subsidiary of *United States Steel Corporation*, is operating a small pilot plant on the large magnetic iron ore property it has optioned from *Klukwan Iron Ore Corporation*, a subsidiary of *Quebec Metallurgical Industries Ltd.* Columbia has an option on the property for four years, with the right to lease for 75 years on a royalty basis or to purchase it outright for $10,000,000. Churn drilling is being carried out to confirm the reserves available.

BRITISH COLUMBIA — The old *Phoenix* copper mine near Greenwood will be returned to production this summer by *Granby Consolidated Mining, Smelting and Power Company* through a subsidiary, *Phoenix Copper Company Ltd.* A camp has been completed, and a 700-ton-per-day concentrator is under construction. Exploration started in 1955 has disclosed more than 1,000,000 tons of 1 percent copper ore and nearly 400,000 tons of 0.92 percent ore in another area. Open-pit mining is planned. *Newmont Mining Corporation* has awarded Granby a mining and milling contract to develop a small nickel-copper ore body near New Hope, B.C. The property is owned by *Western Nickel Company*, which, in turn, is owned by *Pacific Nickel Mines*, Newmont, and *Sherritt Gordon Mines*. Reserves are estimated at 1,300,000 tons, averaging 1.39 percent nickel and 0.5 percent copper, with some cobalt.

SASKATCHEWAN—The shaft has been collared at the new operation of *Black Bay Uranium* and the sinking of the 450-foot, three-compartment shaft from the adit has been started. This is a recently acquired property known as the *Fishhook Bay*. At the company's original property, the *Black Bay* several miles away, ore has been stockpiled pending shipment to the Lorado mill for treatment. When the Lorado is in operation, it will receive at least 25 tons a day from the Black Bay, in addition to tonnages from the Fishhook Bay.

BRITISH COLUMBIA—A new company, *Daybreak Mining Corporation Ltd.*, has acquired the former *Gibson* silver-lead-zinc mine on Kootenay Lake near Kaslo. *Henry L. Hill & Associates* have been retained to make a survey and to recommend development plans.

ONTARIO—*Geco Mines Ltd.* expects production to start in August at its copper-zinc mine in the Manitouwadge area where the company has 46 claims. The 3,300-ton-per-day concentrator should be in operation at that time. The company has sunk two shafts—one to 1,500 feet and the other to 500 feet. Ore reserves in the "A" ore body have been increased by about 250,000 tons since the original estimates of 5,611,251 tons. The average grade is 2.19 percent copper, 1.79 percent zinc, and 1.33 ounces silver per ton.

MANITOBA—*Montgary Exploration* has given *American Metal Company* an option to bring its *Bernic Lake* lithium property into production. The agreement is subject only to approval by Montgary stockholders, and gives American Metal until November 1, to exercise the option. Diamond drilling has already indicated an estimated 7,887,218 tons of 1.85 percent lithium oxide. Amco will carry out further underground testing of the ore body. If the option is exercised, a new company will be formed. Amco will hold a 60 percent interest and Montgary 40 percent. A 1,000 to 1,500-ton concentrator would also be built.

SOUTH WEST AFRICA—Unconfirmed reports point to disclosure of a major copperbelt having been located in the territory. It is understood that *Lorelei Copper Mines Ltd.*, which has already proved copper-molybdenum ore reserves to the extent of about 20,000,000 tons and is conducting small-scale productive operations, is the subject of negotiations for an exchange of stock. The *South Africa Minerals Corporation Ltd.*, which is expanding output of manganese ore from its South West African deposits and is conducting an intensive program of exploration for extensions to these deposits, has had encouraging disclosures of other minerals as well. The latter are said to include phosphate, vanadium, and radioactive minerals.

FEDERATION OF RHODESIA AND NYASALAND—After a postponement of its long range open-pit development program earlier this year, *Nchanga Mines* has decided to proceed with a modified plan involving some reduction in rate of development and a smaller belt conveyor transport system. The company's operations are in Northern Rhodesia.

UNION OF SOUTH AFRICA—*Middle Witwatersrand (Western Areas) Ltd.* has abandoned all of its mineral option holdings in the Ventersdorp and Lichtenburg areas of the Western Transvaal, west of Klerksdorp, and in the Hoopstad and Boshof areas of the Orange Free State; and options over a large area in the vicinity of Delmas and Leslie in the Eastern Transvaal. The company has not yet reported the start of exploratory operations in the option area of about 43,200 claims recently acquired to the south of Potchefstroom in the Western Transvaal. In this general area, and particularly more to the west, the *Union Corporation* has conducted extensive exploration in the past.

FRENCH WEST AFRICA—*Frobisher Ltd.* is reported to have sold 15 percent of its 34 percent option in *Miferma (Societe des Mines de Fer de Mauretanie)* to the Italian steel group *Finseder*. Purchase of Frobisher's remaining 19 percent interest reportedly is being considered by Dutch, German, and other interests. Frobisher first sponsored investigation of the hematite deposits at Fort Gouraud in 1952, and subsequently formed a company with *British Iron and Steel Corporation, Bureau Miniere d'Outre Mer*, and other French interests. Though the mines have a potential output of 100,000,000 tons of high-grade iron ore, the directors of Frobisher are said to consider it best

WORLDWIDE PROFESSIONAL DIRECTORY

AGENCE MINIERE & MARITIME S.A.
2 rue Van Bree, Antwerp, Belgium
Sworn weighers, samplers of ores, metals and residues.
Agents for shippers at European ports and plants.
Telegrams: Rentiers—Antwerp—Telex 3169

E. J. Longyear Co.
Geological and Mining Consultants
Photogeology
Minneapolis 2, Minn. ..... Foshay Tower
New York 17, N. Y. ..... Graybar Bldg.
Denver 2, Colo. ..... Colorado Bldg.
Washington 5, D.C. ..... Shoreham Bldg.
North Bay, Ontario .... Canadian Longyear Ltd.
Paris, France ..... Longyear et Cie.

JOHN F. MEISSNER ENGINEERS, INC.
Consulting Engineers
Conveyor Systems — Storage Methods
Crushing Plants — Ship Loading Docks
Materials Handling and Processing Plants
308 W. Washington St. — Chicago 6, Ill.

O'DONNELL & SCHMIDT
Mining Consultants
165 Broadway — Tel. BArclay 7-6960
New York 6, N.Y. — Cables: EXAMIMINES

SCHROTER & LOCKWOOD, INC.
Consulting Engineers and Mining Geologists
Industrial and Strategic Minerals
Costs—Methods—Evaluations—Ore Finding
3513 Sunset Blvd. — Los Angeles 25, U. S. A.
Cable Address: Stratex-Los Angeles

MARK G. SMERCHANSKI
CONSULTING MINING GEOLOGIST
411 Childs Building
Winnipeg, Manitoba — Phone 92-6323

MINING ENGINEERS, GEOLOGISTS AND METALLURGISTS
interested in making contact with *established Canadian mining companies* with a view to employment are invited to write to

CANADIAN METAL MINING ASSOCIATION
Room 335
12 Richmond St. East
Toronto 1, Canada

The Association will be pleased to furnish information concerning mining companies in Canada to which enquiries about employment opportunities can be directed.

Enquiries would be welcomed also from trained and well-qualified mechanics, machinists, electricians and tradesmen.

for the firm to concentrate on projects in more advanced stages of development.

TANGANYIKA—Flood water from the *Mpanda* mine which adjoins the property of *Urawira Minerals Ltd.* broke through into the lower levels of the Urawira mine. Dewatering operations are being carried out and operations have been resumed on the upper levels. The mishap, however, has delayed deliveries of copper to the United States in repayment for loans.

GHANA—The government of Ghana reportedly has decided not to make any contract commitments on the $700,000,000 Volta River hydroelectric and aluminum project until results of a survey by an unidentified United States firm are received. Until now, this four-year-old project had been the joint concern of the Ghana government, the *British Aluminum Company*, and *Aluminum Limited* of Canada.

FEDERATION OF RHODESIA AND NYASALAND—*Bancroft Mines* (Northern Rhodesia) is milling about 40,000 tons of copper ore per month, and is still meeting with some difficulty in both mining and crushing from excessive slush in the ore. Actual milling is proceeding smoothly and results are fully up to expectations. Tonnage rate will be increased as more ore becomes available from the mining operations.

UGANDA—*Sukulu Mines Ltd.'s* preproduction plant is producing 40 tons weekly of apatite concentrate from the extensive apatite-columbium-magnetite deposits in the Sukulu Hills near the Uganda-Kenya border. Decision regarding a full-scale commercial plan and flowsheet will depend upon developments in the fields of metallurgy and marketing during the next few months. Sukulu, which superseded *Tororo Exploration Company*, is owned by *Frobisher Ltd.*, *Uganda Development Corporation*, and *Olin Mathieson Chemical Corporation Inc.*

UNION OF SOUTH AFRICA—*Dominion Reefs (Klerksdorp) Ltd.*, which has increased its tonnage of mined ore for treatment in the uranium plant, has installed larger skips in one shaft, and thereby increased the hoisting capacity.

MOROCCO—Production of iron ore in the northern zone of Morocco reached an all-time high with 1,378,318 tons last year, according to figures released here by the government's Mines Service. Exports also reached a record and exceeded actual output by 10,000 tons. The breakdown of exports was as follows: Spain 289,184 tons; W. Germany 589,000; Netherlands 133,168; France 98,369; Britain 280,234; total: 1,389,955 tons. Lead ore output in the same zone last year was 1,215 tons, antimony ore 593 tons, manganese 865 tons, graphite 125 tons and bentonite 895 tons.

FEDERATION OF RHODESIA & NYASALAND — *Rhodesian Selection Trust* has placed a contract with *Hunting Geophysics Ltd.* for an airborne electromagnetic and radiometric survey over three areas of the Northern Rhodesian copper belt, a total of 3,700 line miles. The Canadian firm has carried out other tests for the Rhodesian Trust in Northern Rhodesia.

FRENCH WEST AFRICA—*Frobisher Ltd.* has agreed to option its 34 percent interest in the *Societe Anonyme des Mines de Fer de Mauritanie (Miferma)* to a European financial group, identity at present not revealed. The company has already received first payment of $500,000; the agreement reportedly calls for a total payment of $2,000,000 if the option is exercised. Frobisher first sponsored investigation of the hematite deposits in 1952, and subsequently formed a company with *British Iron and Steel Corporation* and the *Bureau Miniere d'Outre Mer*. Though the mines have a potential output of 4,000,000 tons of high-grade iron ore annually, the directors of Frobisher are said to consider it best for the firm to concentrate on projects in more advanced stages of development.

GHANA—*Bibiani (1927) Ltd.* is carrying out an exploration program this year between the No. 18 and 24 levels to the south, and on the No. 15, 18 and 24 levels to the north. The No. 2 level will be extended northward to prove the extent of values located in the surface and the No. 21 level will be driven north to a point beyond the Central shaft. At the same time, the old workings on the upper levels will be systematically investigated because results obtained so far suggest that useful tonnages can be added to the ore reserves. These reserves are now adequate to maintain output on the current level of operations (30,000 tons monthly) until 1960.

UNION OF SOUTH AFRICA—*Welkom Gold Mining Company Ltd.* expects to become a full-scale producer by the end of this quarter. In the first quarter of this year, the firm initiated small-scale production of U_3O_8, with an output of 643 pounds. This is a combined project embracing two uranium plants, one on its own property and the other on *President Steyn*. Treatment capacities are being extended to 150,000 tons a month for each plant.

SOUTH WEST AFRICA—*Consolidated Gold Fields of South Africa*, together with the *Anglo American Corporation of South Africa* and the *British South Africa Company*, was successful bidder for the *South West Africa Company* and its holdings. Among its many interests, the South West Africa Company holds a 25 percent share in *Tsumeb Corporation*. The latter had been a bidder for the S.W.A. Company stock. One of the holdings involved in the transaction is the *Abenab Berg* vanadium-lead-zinc deposit in the Grootfontein district.

BELGIAN CONGO—The electrolytic copper-cobalt plant being erected by *Union Miniere du Haut Katanga* at Luilu is expected to be in production in 1960. Maximum use of automation is being made and the project is expected to increase the company's copper production by 100 percent. Initial annual output is to be 100,000 tons of copper and 500 tons of cobalt; these figures are then to be tripled in the next 10 years. 50,000 workers needed to operate the plant will be housed in a model town now being built nearby.

EGYPT—The iron and steel plant under construction at Helwan is nearing completion. It will process iron ore from the mines at Aswan which, in 1956, produced 133,000 tons of ore. Other high production figures in 1956 include 615,003 metric tons of phosphate rock and 192,831 tons of manganese ore. The manganese came from mines in Sinai and new mines at Elba. From this production, 19,228 metric tons were of chemical grade dioxide ore and the rest was metallurgical grade. The Department of Mines and the Geological Survey of Egypt are making great numbers of expeditions into the Egyptian desert. No report of their activities has been published, but they are said to be investigating new mineral discoveries.

MOROCCO—It is expected that 1,155,000 tons of iron ore will be exported this year, with overall production about the same as in 1956 unless the *Djebel Ank* mine, closed since April 1956, resumes production. Output in 1956 totaled 1,170,122 tons, as compared with 1,140,078 in 1955; exports rose from 1,142,504 tons in 1955 to 1,156,700 tons in 1956. Output came from the *Djebel Djerissa* iron mines, and smaller mines at Douaria, Tamera, and El Harrech.

Solvent Extraction Terms

Continued from page 47

equation in which uranium enters the organic phase as an oil soluble salt of the organic acid. A typical equation for this reaction is:

$$UO_2^{++}\ (\text{aqueous}) + 2HR_2PO_4\ (\text{organic}) \rightleftarrows (UO_2)(R_2PO_4)_2\ (\text{organic}) + 2H^+\ (\text{aqueous})$$

(Where R represents the 2-ethylhexyl group of the Di 2-ethylhexyl phosphoric acid.)

STRIPPING: Removal of the uranium from the loaded solvent (extractant) by a basic equeous solution. It is exactly the reversal of extraction. It is extraction, from the solvent, by a stripping solution. These stripping solutions could be ammonium and sodium carbonates, slurries of lime or magnesia, or concentrated acids.

When solutions of sodium carbonate are used as stripping agent the uranium in organic phase is transferred to aqueous phase as a soluble carbonate complex. At the same time, the organophosphate complexed with the uranium, together with any excess organophosphorous acid, is converted by alkaline sodium carbonate solution to the sodium salt. These reactions are, first, for the extractant loaded with uranium, and, second, for the extractant alone.

1. $UO_2\ (\text{organic})_2 + 3NA_2CO_3 = 4Na^+ + UO_2(CO_3)_3 + 2Na\ (\text{organic})$
2. $2H\ (\text{organic}) + Na_2CO_3 = 2Na\ (\text{organic}) + H_2O + CO_2$

Remember that the following solvent extraction (SX) terms are synonomous with resin in pulp (RIP) terms:

Extractant	**Resin**
Strip	**Elute**
Saturation limit	**Break through**

U.S.A. Metal & Mineral Prices

METALS

		June 12, 1957
COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	32.00¢
	Lake. Delivered, destinations, U.S.A.	32.00¢
	Foreign Copper. Valley basis	32.00¢
	Custom	30.00¢
LEAD:	**Common Grade.** New York	14.00¢
ZINC:	**Prime Western:** F.o.b. E. St. Louis	11.00¢
	Prime Western: Delivered, New York	11.50¢
	Tri-State Concentrate, 60% zinc, per ton	$64.00
ALUMINUM:	**Primary 30 Pound Ingots (99% plus).** F.o.b. shipping points	27.10¢
ANTIMONY:	**Lone Star Brand.** F.o.b. Laredo, in bulk	33.50¢
BISMUTH:	(In ton lots) price per pound	$2.25
CADMIUM:	**Sticks and bars.** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97.99%,** keg of 550 pounds (Price per pound)	$2.00
COLUMBIUM:	**Powder** Nom., per pound	$120.00
GERMANIUM:	**Germanium:** dioxide, high purity, gram	24.00¢-30.00¢
LITHIUM:	**98%** (per pound)	$11.00-$14.00
	Carbonate	82.00¢
MAGNESIUM:	**Ingots (99.8%)** F.o.b. Velasco, Texas, per pound	36.00¢
MERCURY:	**Flasks.** Small lots, New York	$255.00-$257.00
NICKEL:	**"F" Ingots (5 pounds).** F.o.b. refinery, Port Calbourne, Ontario	75.50¢
PLUTONIUM:	To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	$30.00
SELENIUM:	**99.5%,** per pound	$13.50
THORIUM:	per kilogram	$43.00
TIN:	**Grade A Brands.** New York (Price per pound) Prompt delivery	98.25¢
TITANIUM:	**99.3%** + Grade "A" Sponge (Price per pound)	$2.25
URANIUM:	**Nominal,** per kilogram	$40.00
U-235:	**Nominal,** per pound	$7,250
GOLD:	**United States Treasury Price**	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	90.5¢
	Foreign Handy Harmon	90⅝¢
PLATINUM:	**Per Ounce**	$92.00-$95.00
ZIRCONIUM:	**Sponge, Per Pound,** Nominal	$10.00

ORES AND CONCENTRATES

BERYLLIUM ORE:	**10 to 12% BeO.** F.o.b. mine, Colorado ..... $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight. **African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio** ..... $56.00-$57.00 **African (Transvaal). 48% Cr_2O_3. No Ratio** ..... $40.00-$41.00 **Turkish,** 48% Cr_2O_3. 3 to 1 chrome-iron ratio ..... $60.00 U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade are and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12) **Per Pound Pentoxide.** $1.15-1.35
IRON ORE:	**Lake Superior. Per gross ton Lower Lake Ports** **Mesabi, Non Bessemer, 51.5% Fe.** ..... $11.45 **Mesabi, Bessemer, 51.5% Fe.** ..... $11.60 **Old Range Non Bessemer.** ..... $11.70 **Old Range Bessemer.** ..... $11.85 **Swedish,** Atlantic Ports, 60 to 68% Fe. Contracts, Per Unit ..... 28.00¢
MANGANESE ORE:	**Metallurgical grade.** 48 to 50% Mn. Long ton unit ..... $1.45-$1.50 **Metallurgical grade.** 46 to 48% Mn. Long ton unit ..... $1.40-$1.45 **Metallurgical grade.** 44 to 46% Mn. Long ton unit ..... $1.35-$1.40 **Domestic** U. S. Government ore purchasing depots: Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana; base price of $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.
MOLYBDENUM CONCENTRATE:	**90% MoS_2 F.o.b.** Climax, Colorado. Per pounds of contained molybdenum, plus cost of containers $1.18
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit ..... $55.00 **Foreign.** 65% WO_3 Per short ton unit (Scheelite) ..... $20.00 **Foreign.** South American, Spanish, Portuguese $19.00
URANIUM ORE:	**Carnotite-Roscoelite.** F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, Moab, White Canyon, Green River, and Monticello, Utah. Shiprock, and Grants, New Mexico, Edgemont, S. Dakota, Riverton, Wyoming, Tuba City, Arizona. Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ore purchases. Special lime schedule applies at Monticello, Moab and Grants. No lime penalty with no vanadium payment or lime penalty with vanadium payment.
VANADIUM ORE:	**Carnotite-Roscoelite.** V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots, but excess not paid for at Marysvale, Monticello, and Bluewater. Shiprock has no limit on V_2O_5 to U_3O_8 ratio and all contained V_2O_5 is paid for ..... Per Pound V_2O_5 $0.31

NON-METALLIC MINERALS

BENTONITE:	**Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots	$12.50
FLUORSPAR:	**Oil Well grade.** Packed in 100 pound paper bags	$14.00
	Metallurgical grade. 70% efective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines	$40.00
	Mexican. 70% F.o.b. border	$24.00-$24.50
	Acid Grade. 97% CaF_2, Bulk, F.o.b. Kentucky, Illinois, Colorado	$50.00
	Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.	
PERLITE:	**Crude:** F.o.b. mine per short ton	$3.00 to $5.00
	Plaster grades. Crushed and sized. F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$25.50
	Export	$30.50

LONDON METAL AND MINERAL PRICES

		June 12, 1957 Per Long Ton		USA Equivalent cents per pound[1]
COPPER:	**Electrolytic spot**	£232	0s 0d	95.25¢
LEAD:	**Refined 99%**	£ 91	0s 0d	11.37¢
ZINC:	**Virgin, 98%**	£ 73	0s 0d	9.12¢
ALUMINUM:	**Ingot, 99.5%**	£197	0s 0d	24.625¢
ANTIMONY:	**Regulus, 99.6%**	£222	10s 0d	27.81¢
TIN:	**Standard, 99.75%**	£762	0s 0d	95.25¢
TUNGSTEN:	**Long ton unit**	145S		$20.30
		With Sterling pound at $2.80		

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

HERE IS A NEW LARGE SIZE WIRE Kleenslot PREPARATION SCREEN

WEDGE-WIRE profile F217 - .312 high, .187 wide
F250 - .375 high, .191 wide

Especially designed for extended life in abrasive applications. Possesses the necessary construction features to easily maintain openings from ½ inch to as close as 1 m.m. Available in many metals. Furnished in guard bars and special shapes or designs. Adaptable to vibrator applications.

with *IFA

*INDEPENDENT FLEXING ACTION—Unique construction permits individual wires to "flex" independently for greater screening capacities and abilities while maintaining "rigid" requirements.

write for prices and details

WEDGE-WIRE CORPORATION
Wellington, Ohio

Grab Samples

Continued from page 3

bility that these leached outcrops were underlain by enriched sulphide ore. To see the entire area before nightfall, we split up into two parties: Reed and myself in one, March and Watson in the other. Collecting specimens of the outcrops on the way, each party covered as much of the area as was possible before we reunited at sunset at the ruins of the old miners campsite. Enthusiastic, we concluded that some sizable areas had such a type and amount of limonite that they had good chances of being underlain by an enriched blanket of sulphide ore with fair grade and vertical extent. Beyond these areas there were others of even much greater lateral extent, under which we considered that there would exist a thin blanket of secondarily enriched pyritic ore that *might* be of sufficient grade and thickness to be economic.

"We were of course not positive of our predictions. Then, as now, the interpretation of leached outcrops is not an exact science. Likewise, the original ore had obviously such an original high pyrite content that the boxwork types of limonite from whatever copper sulphides that were once present would be obscured (as stated in the Boswell-Blanchard rule) by those of pyrite. Thus it was necessary to depend on the Augustus Locke technique of judgment by the position of the limonite staining with respect to the leached cavity. The similarity of rock type, degree of alteration, and amount of quartz veining, compared with those at Chuquicamata and Potrerillos, strengthened our opinion.

"On the basis of the recommendations of this party, as embodied in W. S. March, Jr.'s report of August 19th, 1942, I. L. Greninger, then general manager of Potrerillos, bought all of the existing Indio Muerto claims and made preparations for the drilling. (I remember the amount paid, which was exceedingly reasonable, but have forgotton the name of the English owner who made the sale.)

"During the next few years a number of Anaconda geologists, including Mulchay and Stephens (1945?), Reno H. Sales (1944), and V. D. Perry, examined El Salvador. Although, if I remember correctly, all of these men considered that the deposit was worth some bore-hole drilling, no active exploration was started at that time.

"In 1947, as I was leaving the employ of the Anaconda company at Potrerillos, I made several additional trips with my successor, William Swenson, to show him the deposit. Later, probably during 1948 and 1949, Swenson working under and with W. S. March, Jr., started the first detailed geologic mapping of the central zone of the deposit.

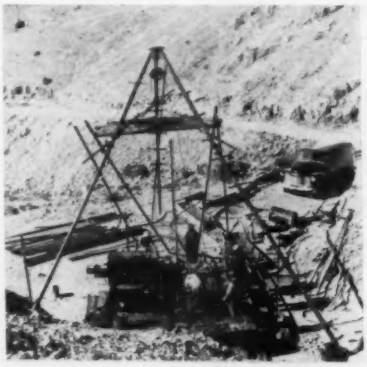
"The subsequent history of the deposit I know only from the published literature. Charles Meyer in the February 1956 issue of *Mining Engineer* wrote: 'The steep slopes of Indio Muerto peak were examined in February 1950, by V. D. Perry, chief geologist, Anaconda, and W. H. Swayne, exploration geologist for Anaconda in South America . . . Systematic field mapping [was performed] by Swayne . . . Several drilling targets were outlined and actual exploration work was started in 1952.' Evidently for three years the drilling of the deposit found only spotty ore showings until in 1955, 'good ore was struck below the oxidized zone in Turquoise Gulch within the shadow of Indio Muerto peak.' "

CLIFFORD WENDEL
ANTOFAGASTA, CHILE

Most significant facts about El Salvador have been outlined by Mr. Weed in a letter to the Editor of MINING WORLD as follows:

"The main point brought out by Mr. Perry is contained in the last paragraph of his memorandum, in which he states that no individual is responsible for the discovery and exploration of El Salvador ore body. It is the result of team work extending from top management to the lowest geologist, and it is the team of which The Anaconda Company is justifiably proud.

"Note also in Mr. Perry's summary he states that suites of significant rock specimens were collected and sent to the Butte Geological Laboratory. In 1942 The Anaconda Company established a geological laboratory in Butte under the direction of Mr. Reno H. Sales. For the first few years it was under the immediate supervision of Mr. William H. Swayne, who was succeeded by Mr. Charles Meyer. At the present time Mr. Lester Zeihen directs the laboratory.



DIAMOND DRILLING at El Salvador mine was an important phase in developing more than 200,000,000 tons of copper ore.

"Anaconda does not claim that the laboratory finds ore bodies, but the information furnished by the laboratory to the men in the field assists these field men in their studies and interpretation of the geology. This information, which was not available to our earlier investigations of the Indio Muerto area, enabled Mr. Swayne to produce a very complete and informative geological map of the area."

At the end of 1956 reserves of ore at El Salvador were reported by The Anaconda Company at 300,000,000 tons averaging 1.6 percent copper. Conditions are favorable for the development of additional ore.

The mine is being developed for a daily production of 25,000 tons of ore. A new crushing plant and mill will be built at the mine with concentrate smelted at Potrerillos. Full production of 200,000,000 annual pounds of copper is scheduled for 1959.

Through the cooperation of C. E. Weed, president of The Anaconda Company, who is familiar with the work in connection with El Salvador because most of the work there was done under his direction, the following memorandum was prepared by V. D. Perry, Anaconda's vice president and chief geologist.—Ed.

"The story of Anaconda's discovery of El Salvador Mine, Chile, is documented in the files of Anaconda's Mining Department, New York, New York. The facts summarized below are from that record. No authentic information is available to explain the existence of a few abandoned pits and shafts located around the foothills of Indio Muerto Mountain and short distances removed from the area where El Salvador deposit was subsequently found. Within the barren outcrops overlying the ore body there are a few shallow turquoise diggings that go back to the days of the ancient Inca or pre-Inca tribes.

"The first evidence of Anaconda's interest in the area is contained in a letter dated January 19, 1922 from I. L. Greninger, then mine superintendent at Potrerillos, to O. M. Kuchs, general manager, describing certain claims near Indio Muerto Mountain, 30 kilometers air-line north of Potrerillos, where scattered diggings showed evidence of copper mineralization. Greninger's letter stated that the property, if located close to transportation, would be worth investigation but the possibilities of tonnage did not appear to be great enough at that time to justify building transportation facilities.

"During the development and construction period of the Potrerillos mine and in the following depression years there was no active interest in the Indio Muerto district. In 1942 a reconnaissance examination of part of the district was made by Walter March, then chief geologist for Chile Copper Company, E. F. Reed, Sam Watson, Jr., and Clifford Wendel, geologists on March's staff. These men visited the Camp area and adjoining ground north of Indio Muerto peak but the reconnaissance did not fully cover the mineralized region and there is no reference in their report to the southerly or Turquoise Gulch area. The report recommended further geological examination after claims had been denounced to cover all the mineralized outcrops. The file contains a memorandum from C. E. Weed stating that the recommendations of the March report should be followed. Accordingly, the Andes Copper Mining Company's management, on instructions from Burr Wheeler, vice president, under date of January 2, 1943, asked Greninger, then general manager at Potrerillos, to follow-up the Geological Department recommendations.

"Greninger acted by initiating a move to acquire title to the few claims in the vicinity of Indio Muerto Mountain. In February 1944, Reno H. Sales, chief geologist, Anaconda, made a brief visit to Indio Muerto accompanied by V. D. Perry, March, and Wendel. The examination was restricted to the Camp area and the porphyry hill north of the Camp; it did not cover Turquoise Gulch.

"Further geological mapping was done from June 30 to August 6, 1945 by R. B. Mulchay, E. C. Stephens, Anaconda geologists and Watson of the Andes staff. Their report recommended additional exploration of the Camp area.

"Following the Mulchay-Stephens report, R. S. Newlin of the New York min-

ing department informed the local management that Andes should perfect titles and make necessary additional denouncements to cover favorable areas.

"In February 1950 Perry and William Swayne, Anaconda exploration geologist for Chile, visited the property. A letter dated April 28, 1950, Perry to Weed, emphasized the possibility of a hidden copper deposit under leached oxide capping in the vicinity of and extending westerly from Indio Muerto peak into the area of Turquoise Gulch. The letter recommended a policy of aggressive exploration with Swayne assigned to prepare an accurate survey of the claims, to monument them, and to continue the detailed geological mapping.

"Surveys were started immediately, monuments erected, and geological plans and sections were prepared by Swayne and his assistant, John Bain. Suites of significant rock specimens were collected and sent to the Butte Geological Laboratory for study by Charles Meyer, Anaconda research geologist. A detailed report on the area was submitted by Swayne in May 1951 and specific drill hole recommendations were made. The project received official approval, and Swayne, with the help of an assistant, Hans Langerfeldt, organized, directed and serviced the drilling job. The first two holes on the steep slopes of Indio Muerto peak immediately north of Turquoise Gulch disclosed a thin blanket of secondary chalcocite enrichment. A third hole in the Camp area, 1½ kilometers north of Turquoise Gulch, cut a deep section of disseminated primary chalcopyrite, and offset holes developed a relatively small tonnage of low grade primary copper mineralization called the Camp orebody.

"In April 1954 work was resumed in Turquoise Gulch and by July of that year drill holes intersected important secondary chalcocite ore below the barren oxidized outcrops of the gulch. This development proved to be the discovery of El Salvador ore body.

"In November 1955, orders were given by the Mining Department to accelerate the surface and underground development in order to bring El Salvador into production at the earliest possible date. The stepped-up program was placed under the direction of C. M. Brinckerhoff, vice president, Chile and Andes companies and under the immediate supervision of N. E. Koepel, general manager, Andes, and H. E. Robbins, general superintendent of the Andes company. The geological work, including location and control of development holes and crosscuts, continued under the general direction of Swayne and the immediate supervision of Frank Trask, chief geologist, Andes company, and assistants.

"In summary, the story of El Salvador exploration testifies to consistent interest and effort on the part of many members of the Anaconda team to bring a new property into production. Ideas, originating from various geological studies and detailed mapping were translated into practical conclusions and recommendations. The consistent policy of management in approving and supporting these recommendations and the aggressive action of the Geological Department in getting the drilling done under difficult physical conditions, resulted in discovery and development of a major copper ore body."

V. D. Perry
Vice President and
Chief Geologist

Keep sticky ores moving out of bins and hoppers —and through chutes

Syntron Bin Vibrators are designed to keep bulk materials flowing freely out of bins, hoppers and chutes.

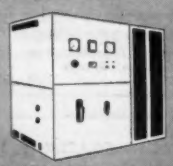
Their controllable, high-speed vibrations, 3600 per minute, keep coal, ore, and other bulk materials moving through bin and hopper discharge openings to screens, feeders, belt conveyors, picking tables and other processing equipment. Syntron Bin Vibrators prevent work stoppages and slow downs due to materials arching and plugging in storage hoppers. Eliminate hazardous manual rodding and poking to free materials.

Syntron Bin Vibrators are available in sizes to handle from 1 cubic foot hopper to large bins and bunkers.

Builders of quality equipment for more than a Quarter-Century,

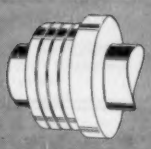
Other SYNTRON Equipment of proven Dependable Quality

AC TO DC POWER CONVERSION UNITS



TEST SIEVE SHAKERS

SHAFT SEALS



Write for complete catalog data — FREE

SYNTRON COMPANY
166 Lexington Avenue Homer City, Penna.

PROFESSIONAL DIRECTORY

One-Inch Card, $80 Yearly—½-Inch, $35 Yearly, Payable in Advance.

CONSULTING ENGINEERS:

CHAPMAN, WOOD AND GRISWOLD
Mining Engineers & Geologists
Appraisals, Exploration & Development
Assaying
P.O. Box 8302 — Albuquerque, N. M.
Wagner Building — 530 Jefferson, NE
Ph: 6-1675

COWIN & CO., INC.
Mining Engineers and Contractors • Consulting Appraisal Reports • Shaft & Slope Sinking • Mine Development • Mine Plant Construction.
1-18th Street, S. W. Birmingham, Ala.
Phone 56-5566

D. H. ELLIOTT
MINING PHOTOGEOLOGIST
P.O. Box 1007 — Casper, Wyoming

GUY E. INGERSOLL
Registered Professional Engineer in Texas, Arizona and New Mexico
Mine Examinations and Geological Reports
5505 Timberwolf Drive — El Paso, Texas

HERBERT BANKS JOHNSON
CONSULTANT
Electrostatic Separation
Process Developments
804 Franklin Street — Clearwater, Florida

PHILIP L. JONES
Consultant
Mineral Economics & Mineral Dressing
Heavy Media Specialist
405 Miners Bank Bldg. — Tel. MAyfair 3-7161
Joplin, Mo.

C. P. KEEGEL
Mining & Metallurgical Engineer
Administration — Appraisal
1721 So. Fourteenth St. Tel. DUdley 4-6981
Las Vegas, Nevada

MAC AFEE and COMPANY
Consulting Engineers
MINE EXAMINATION & MILL DESIGN
Exploration • Construction
Operation & Management
CHEMICAL & METALLURGICAL LABORATORY FOR EXACT QUANTITATIVE FLOWSHEET DATA
3305 Wilshire Boulevard • Los Angeles 5
Dunkirk 8-9674 — CABLE: MACAFEE

KEN MC GRIFFIN
Geologist—Geophysical Engineer
Consultant
Base Metal Property Evaluations and Exploration Projects
438 South Main Street — Phone EM4-0202
Box 1856 — Salt Lake City 10, Utah

MURPHY, F. M.
Consulting Mining Geologist
1201 Maryland Parkway, Las Vegas, Nev.
Dudley 4-5235

JOHN J. O'KEEFFE
Consulting Mining Engineer & Geologist
Examinations • Valuations • Management
822 E. Compton Blvd, Compton, California
Tel: NEwmark 1-7825

HOWARD P. SHERMAN
Mining and Consulting Engineer
Examinations—Valuations—Reports
W. 2404 Upton Ave., Spokane 13, Washington

STILL & STILL
Consulting Mining Engineers and Geologists
Room 24 Union Block — Prescott, Arizona

TATE MINING & DEVELOPING COMPANY
Shafts—Drifts—Location Pits—Roads. Underground or surface, Development contractors. No job too large or too small—We go anywhere
3438 North Kelvin Blvd. — Tucson, Arizona
Telephone EAst 6-8348

TURNER & ASSOCIATES
Consulting Mining and Water Geologists
350 East Camelback Road, Phoenix, Arizona
Crestwood 4-2262

GEOLOGICAL & GEOPHYSICAL SURVEYS
Exploration Programs & Property Evaluations
Magnetic, Gravity, Electrical & Radioactivity Surveys for Mineral Deposits & Petroleum
CLYDE H. WILSON
Geologist—Geophysical Engineer
WILSON EXPLORATION COMPANY
366 So. Fifth East, Salt Lake City 2, Utah

WISSER AND COX
Consulting Mining Geologists
55 New Montgomery St.
San Francisco, California

HARRY J. WOLF
Mining and Consulting Engineer
Examinations—Valuations—Management
One Park Place, New York 7, N. Y.
Cable: MINEWOLF — Tel.: REctor 2-5307

CHEMISTS, SAMPLERS, SHIPPERS' REP'S:

ARIZONA TESTING LABS
Chemists — Spectroscopists — Assayers
Box 1888 — 817 W. Madison — Phoenix
Box 2508 — 414 5th Avenue — Tucson

B. W. DEASON — V. E. WORSLEY
BLACK & DEASON
Assayers and Chemists
Ore Shippers Represented at all Smelters
P. O. Box #1888 — Salt Lake City, Utah

THE COLORADO ASSAYING CO.
ASSAYERS, CHEMISTS and SPECTROGRAPHERS
Est. 1900
Gold and Silver $2, Copper $1, Uranium $7.50. Send for free copy of our Mineralogist Pocket Reference Giving Detailed Information on all Principal Ores.
2013 WELTON ST., DENVER 1, COLORADO

T. G. Deggendorfer
Shippers' Representative
Control Assays
Box 840 — Kellogg, Idaho

DICKINSON LABORATORIES, Inc.
Assayers—Chemists—Metallurgists—Umpires
Shippers Representatives at Local Smelters
Representatives at Mexican Border
Points for Shippers of Manganese and Fluorspar
P.O. Box 7006 — El Paso, Texas

GOODALL BROTHERS
ASSAYERS AND CHEMISTS
SHIPPERS' REPRESENTATIVES
Helena — Established 1909 — Montana

HANKS, INC., ABBOT A.
ASSAYERS AND CHEMISTS
Supervision of Sampling at Smelters
Spectrographic Analysis
624 Sacramento St. — San Francisco 11

HAWLEY & HAWLEY
W. E. HAWLEY, Mgr.
Assayers, Chemists
Shippers' Representative
P. O. Box 1060 — Douglas, Arizona

LEDOUX & COMPANY
Established 1880
Chemists—Spectroscopists—Assayers
Consultation & Research
Mine Examination & Analyses
Shippers Representatives at Seaports and Refineries throughout the U. S.
359 Alfred Avenue, Teaneck, New Jersey

• SPECTROGRAPHIC ANALYSES
• EVALUATION • RESEARCH
ORE RESEARCH AND LABORATORIES, Inc.
WRITE FOR BROCHURE — DEPT. C
1511 LEVEE STREET — DALLAS 7, TEXAS

SILVER IS OUR BUSINESS
Will investigate mine or prospect. Send samples for analysis. Give full data, location, etc.
PIGGOTT PROJECTS — 1057 Howard Street
San Francisco, California

SMITH-EMERY COMPANY
Established 1910
Assayers—Chemists
Metallurgists
Spectrographers
Shippers' Representatives
Price List on Request
781 East Washington Blvd., Los Angeles, Calif.

SOUTHERN SPECTROGRAPHIC
Laboratory
Chemists—Spectrographers
Spectrographic Semi-Quanatative $10
Box 6014 Dept. B Dallas 22, Texas

Wood Assaying Co., Henry E.
Established 1878
ASSAYERS and CHEMISTS
733 W. Colfax — Denver 4, Colorado

Personalities

Continued from page 75

Thomas R. Carlson, former first assistant D. & B. foreman; **Maurice C. Colyar,** level foreman; **Kenneth D. Gadd,** level foreman; **Dean D. Kerr,** industrial engineer; **Harvey V. Nelson,** level forman. **Ballard J. Dutson** and **Joseph N. Petrlich** have moved up from gang boss to level foremen; **Pete Saltas** from level drill foreman to assistant D. & B. foreman; and **Frank Stepan** from level drill foreman to assistant drilling and blasting foreman. In the mill department, **Horace A. Ensign** and **F. C. Green, Jr.** have been promoted from flotation shift boss to swing repair foreman; **John C. Larson** and **Elmer C. Speers** from industrial engineer to general mill foreman; and **Bruce Lentz** from industrial engineer to flotation shift boss.

A. F. Peterson, Jr. has been appointed assistant manager of the New York Ore Division of Jones & Laughlin Steel Corporation at Star Lake, New York. **W. F. Smith,** former chief chemist, has been transferred to the Aliquippa Works in Aliquippa, Pennsylvania. **Arnold Porteous** replaces him as chief chemist for the New York Ore Division.

Obituaries

Cornelius F. Kelley, 82, died May 12 at Harkness Pavilion, Columbia Medical Center, New York City, following an operation. Mr. Kelley had been associated with the Anaconda Company since 1901 when he entered the legal department after serving in the Montana House of Representatives. He was promoted to general counsel in 1908; became vice president and director in 1911; was president and director from 1918 to 1940; chairman and director from 1940 to 1955; and became chairman of the executive committee in June 1955.

Donald B. Gillies, retired vice president of Republic Steel Corporation, died at the age of 83 in Cleveland, Ohio. He started his mining career in 1893 after his graduation from Michigan College of Mining and Technology. He became manager of the Mexican operations of Corrigan, McKinney & Company in 1906 and in 1916 was made vice president in charge of operations, with headquarters at the company's Cleveland office. In 1932 he was named president and remained in that post until the firm merged with Republic Steel in 1936. He made important contributions in the building of Republic's raw material reserves. Mr. Gillies was, at one time, president of the A.I.M.E. and the Lake Superior Iron Ore Association.

Joe Larson, 84, died in Jerome, Arizona recently. Mr. Larson was active in Arizona mining and prospecting and at the time of his death was the owner of several patented claims. When the Jerome mining district was beginning to boom, he played an important part in promoting and building many successful mining properties such as the Green Monster, the Calumet and Jerome, the Jerome Del Monte, and the Gadsden groups. Mr. Larson was born in Smaland, Sweden in 1872 and came to the United States in 1888.

Harold Lakes, eminent mining engineer of Nelson, British Columbia, died recently at the age of 70. He is credited with the discovery of the famed Emerald tungsten mine near Salmo, British Columbia, and was consulting engineer for the operator, Canadian Exploration, Ltd., at the time of his death.

John C. Pickering, retired mining engineer, died at the age of 73 in Fort Lauderdale, Florida recently. He actively engaged in mining in Latin America, Africa, and the United States. From 1927 to 1939 he was general manager of the Patino Mines and Enterprises Consolidated, Inc., in Bolivia. He retired in 1939.

Edward Wilder Shepherd, 80, died in Bartow, Florida recently. For 20 years he had been pit foreman for the old Royster phosphate operations before his retirement.

DRILLING COMPANIES:

NEW YORK-ARIZONA DEVELOPMENT CORP.
Diamond Core Drilling
614 Mayer-Heard Building — Box 347
Phoenix-Arizona — Globe, Arizona
Phone Alpine 2-8614

MOAB DRILLING COMPANY
Diamond Core Drilling Contractors
"Uranium Exploration is our Business"
Charles A. Steen, President
Wm. H. Lewis, General Manager
62 E. Center — Box 487
Phone Alpine 3-4181 — Moab, Utah

LIVINGSTON & WILSON EXPLORATION & DRILLING Co.
AIR DRILLING
SEISMOGRAPH DRILLING
DIAMOND CORE DRILLING
CORE & SAMPLE DRILLING
45 Years Combined Drilling Experience
Fred L. Livingston and Walter W. Wilson
Longmont Long Distance - - - PRospect 6-1735

DIAMOND DRILL
Contracting Company
S. 18 Stone, Spokane 31, Wash.
- "SUPER PIONEER" hand portable core drills
- "K & S INTERNATIONAL" standard surface drills
- "DIA-HARD" Core Barrels
- And a complete line of "Super Pioneer" and standard diamond drilling accessories.

TECHNICAL-MINING PERSONNEL
Nation wide recruitment through 68 offices of the National Ass'n of Personnel Consultants at no charge to the employer. The Pacific Northwest's leading employment firm.
ACME PERSONNEL SERVICE
Valley Office, 8906 E. Sprague Ave., Spokane, Wash.
WA 4-2011

EQUIPMENT LOCATED
GA.–N.Y.–CALIF.–OHIO–TEXAS–ILL.

GRINDING MILLS
BALL MILLS—3'x4', 4'x8', 5'x6', 5'x8', 5'x10'. 6'x5', 6'x7', 6'x8', 6'x10'.
HARDINGE MILLS—4'6"x16", 6'x14", 6'x22", 6'x36", 7'x22", 8'x36", 8'x48", 10'x48".
ROD MILLS—3'x8', 5'x10', 6'x6'x14".
TUBE MILLS—5'x14', 5'x22', 5'6"x22', 6'6"x21', 7'x24'.

FILTERS—SEPARATORS—CLASSIFIERS
OLIVER DRUM—8'x10', 12'x14', 14'x18', 11'6"x 18'.
AMERICAN—12'-6" Dia. 9-Disc.
DORR RAKE CLASSIFIERS—5'x25', 8'x38', 12'x 31', 14'x30'.
DORR BOWL RAKE—3'x24'x12', 5'x30'x26', 16'x 24'x28'.
17 THICKENERS—100', 80', 36', 24', 16' & 12'.
20"x15 EAGLE SINGLE SCREW COARSE MATERIAL WASHER

ROTARY DRYERS & KILNS
DRYERS—36"x20', 4'x20', 6'x28', 6'x60', 8'x 125'.
KILNS—6'x28', 6'x72', 6'x7'x80', 8'x125'.

JAW CRUSHERS
BLAKE TYPE—66"x84", 36"x48", 30"x36", 24"x 36", 18"x36", 16"x32".
SINGLE SHAFT—25"x40", 20"x36", 18"x36", 10"x24".
CAM & ROLLER—24"x40", 14"x26", 11"x16", 10"x20", 6"x20".

GYRATORY FINE REDUCTION CRUSHERS
SYMONS—3'. 20".
KENNE DY—198, 258, 378.
SUP. MC C—6", 10", 18".

GYRATORY PRIMARY CRUSHERS
6", 10", 14", 16", 20" & 36" SUP. McC.—GATES AL. CHAL. 3, 4, 5, 6, 7½, 8, 9, 12K.

VIBRATING SCREENS
1—4'x10', 3—4'x8—2 Deck Niagras. 1—5 x14' SECO 3 Deck.

NEW 42 IN CONVEYOR BELT
240', 8-PLY, ¼" TOP, 1/32" BOTTOM.
113', 6-PLY, 3/16" TOP, 1/16" BOTTOM.

DIESEL LOCOMOTIVES
25 TON AND 44 TON GEN ELEC DIESEL ELEC.
80 TON AND 100 TON GEN ELEC DIESEL ELEC.
6 TON WHITCOMB 36" GA

AIR COMPRESSORS
3000 FCM SULLIVAN 500 HP, 2300 VOLTS
2—2750 CFM Myer RAND, 478 HP, 2200 VOLTS

MINE CARS
150 KOPPLE 1 & 1½ YD., 24 GA. V-SHAPE.

MINE LOCOMOTIVES
18 MANCHA 1½, 3, 5, 8, & 10 TON BATTERY.

MINE LOADERS
7 EIMCO 105, 21, 12 B, 40.

WANTED—IDLE EQUIPMENT

DARIEN, 60 E. 42nd St., N.Y. 17, N.Y.

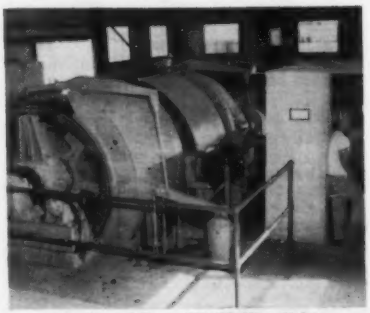
TRANSITS: 20 second, precision heavy-duty instruments with case and extension tripod.
$395.00 F.O.B.
TRI-SPECTIVE ENGINEERING
307 Rose Avenue, Venice, California

FOR SALE OR LEASE
33 claims of Specular Hematite and Magnatite iron ore. Average assay samples 64.7% iron. Located in Lemke County, Idaho. Write or contact
Kenneth Wood, Rexburg, Idaho
Phone ELM 6-6902
E. A. Rassmussen, Rexburg, Idaho
Phone ELM 6-8048

7-W DRAGLINE
140' boom — 8 yd. bucket
Stanley B. Troyer Equipment Co.
Crosby, Minnesota

WANTED

USERS OF EXCELLENT MACHINERY



Nordberg 2-Drum 500 HP Mine Hoist

COMPRESSORS:
1—2300 CFM PRE-2 I-R 500 HP Syn. Mtr. & Elec. Controls
1—1500 CFM Worthington, Size 23 & 14x16, 300 HP Syn.
1—1100 CFM Joy WN-114 Model E, 200 HP Syn. Mtr. Excellent.

HOIST, MINE SHAFT
1—900 HP Allis-Chalmers Double drum, 48,-600# 850 FPM, Post brakes, Sectional, 900 HP V. DC Motor & Controls. Excellent.
1—800 HP Nordberg Double Drum, 43,700# at 100 FPM can be converted to 1600 HP. Sectional Construction. Pass thru 7'x6'10", 800 HP 600 V. DC Motor. Excellent. Write for Specs.
1—500 HP Nordberg Double Drum, 16,000# At 1200 CFM Post brakes, 500 HP G.E. Motor, 2300 V., 1952, Excellent. Nearly new.
1—300 HP Wellman-Seaver-Morgan Single drum, 16,500# @ 825 FPM, herringbone gears, dynamic braking, complete.
1—300 HP Vulcan-Denver Single Drum 20,000# @ 500 FPM. Excellent.
1—375 HP Wellman-Seaver-Morgan 2-drum 14,-000# @ 1000 FPM.
1—250 HP Vulcan Cylindro-Conical Drum Hoist, 10,500# Designed for 575 ft. max. depth. A REAL BUY!
1—150 HP Vulcan Single Drum Hoist 6000# @ 725 FPM, 150 HP Mtr., 2300 Volt.

MINE CARS:
140—10-ton Rotary Dump, 30" ga.
28—4½-ton Granby Type, 30" ga.
26—cu. ft. Granby Type, 24" ga. excellent condition
52—18½ cu. ft. End Dump, 18" ga.

LOCOMOTIVES:
2—2½ ton Greensburg Pony, 24" ga. w/charger
2—4-ton Mancha Battery, 24" Ga. Complete.
1—6-ton Goodman Battery, 24" Ga. Excellent.
3—18-ton Baldwin-Westinghouse Trolley, 30" ga.
1—4½ Ton Mancha Battery, 18-24" Ga.
1—1½ ton Baldwin Battery, 18" ga.
1—Eimco, air operated, 24" ga.

REWARD!!!
$100.00 to anyone who can find a buyer for 6" Forged Steel Mill Balls. Contact us for Reward.

HEADFRAMES:
1—66' high, all steel single compt. incline type, 250 T. Bin chutes, absolutely excellent. Priced to sell!
1—90' high, all steel 2-compt. vertical, 250 T. Bin.

MUCKING MACHINES:
3—12-B Eimco, 18" Ga. Reconditioned.
1—105 Eimco, 1½ yd. bucket

RAIL
275 tons—50# Rail
65 tons—70# Rail
80 tons—72# Rail

MILLS, BALL
12—8x6 Marcy Type, 225 HP
2—8x6 Marcy Type, Ball, Helical gears, wave type liners, 225 HP Syn. Mtr. Excellent.
1—6x8 Allis-Chalmers, Ball, 150 HP
1—8'x48" Hardinge, Conical, 200 HP
7—6x12 Allis-Chalmers Ball, 150 HP.

BALLS, MILL
500 Tons—6" forged steel Mill Balls.

FEEDERS:
1—54"x16' Stephans-Adamson Apron type, heavy-duty, 7½ HP Motor.
6—60"x78" Apron Type Heavy-duty
1—Hardinge Constant Weight Feeder, Type "D"

CRUSHERS, JAW
3—36"x48" Buchanan w/150 HP Motor.
2—60"x24" Traylor Rolls w/motor.
1—9"x16" Eimco w/motor.
1—10"x21" Telsmith Roller Bearing.
1—24"x14" Traylor Crushing Rolls w/2-10 HP Mtr.
1—6"x8" Straub, Jaw, 7½ HP Motor.

FLOTATION MACHINES:
2—6-cell Denver #18
1—6-cell Denver #30, 15 HP
3—5-cell 66" Fagergren
5—4-cell 56" Fagergren
2—8-cell 56" Fagergren
1—2-cell #18 Denver
1—3-cell #18 Denver

WEIGHTOMETERS:
16—Merrick, Model E

FILTERS:
1—6' 5-leaf Oliver Disc, Complete
1—6' 6-leaf Oliver Disc, Complete
2—3'x4' Oliver Drum Type Complete
1—8'6"x6-leaf Eimco Disc. Complete.

LABORATORY SUPPLIES:
2—Tyler Rotap Testing Sieve Shakers, 8"
6—Braun UA Pulverizers
1—DFC Elec. Assay Furnace, Type KUA
2—Barnstead Water Stills
1—4½" x 5½" Jaw Crusher
1—Electric Muffle Furnace
1—Galigher Lab. Flotation Cell, 500 GM.
1—Model G, Beckman pH Meter, Portable.

SCREENS:
8—4'x5' Tyler Hummer w/vibrating Heads
1—3'x7' Link Belt, single deck.
1—3x12 Allis-Chalmers, low-head.

—PHONE— —WIRE— —WRITE—

MACHINERY CENTER, INC.

P. O. Box 964, Salt Lake City, Utah Tel: HUnter 4-7601

WESTINGHOUSE MINE LOCOMOTIVES
FOR SALE

1—8 T 250 VDC, 2-31 HP BB Mts. 36-24" Ga.
1—6 T 250 VDC, 2-45 HP BB Mts. 28-24" Ga.
4—6 T 250 VDC, 2-31 HP BB Mts. 30-24" Ga.
1—5 T 250 VDC, 2-22 HP BB Mts. 36-24" Ga.
1—4 T 250 VDC, 2-11 HP BB Mts. 36-24" Ga.

WALLACE E. KIRK COMPANY
7025 Penn Avenue Pittsburgh 8, Pa.
"Over a Third of a Century Serving Mining and Industrial Companies."

MINERAL PROPERTIES WANTED
Western Engineering Corp.
P. O. Box 8
Douglas, Wyoming

GOOD USED EQUIPMENT FOR SALE
BALL MILLS FILTERS
ROTARY DRYERS CRUSHERS
WE BUY AND SELL COMPLETE PLANTS
PERRY EQUIPMENT CORP.
1429 N. 6th St. Phila. 22, Pa.
POplar 3-3505

Air Compressors
1—Worthington. 1285 CFM, 100#, 225 HP, Syn. Motor, Controls, MG Set, Receiver, Complete. Excellent.
1—Ingersoll-Rand PRE2, 2470 CFM, 90#, 485 HP, Syn. Motor, Controls, Complete. Excellent.
E. J. MARRIOTT
204 Davis St., San Francisco 11, Calif.

GLENN B. WILSON
Employment Specialists
306-310 Boston Bldg., 828—17th St.
Denver 2, Colorado

THE MARKET PLACE

FOR ALL YOUR EQUIPMENT NEEDS

CLASSIFIERS

1—27" x 14'8" Denver Simplex Rake Classifier
1—45" x 17'3" Akins Spiral Simplex Classifier

CORE DRILL

1—Sullivan core drill, size 12, A-2 drilling head, driven by Hercules 4 cyl. gas engine, mounted on Chevrolet truck

LABORATORY EQUIPMENT

5—2¼" x 3½" New Morse Lab Jaw Crushers
3—4" x 6" New Morse Lab Jaw Crushers
6—8" New Morse Lab Pulverizers
1—Gates #00 Lab Gyratory Crusher
1—McCully #1 Lab Gyratory Crusher
2—Stearns-Roger Lab Batch Ball Mills
1—8" x 60" New Morse Lab Classifier
2—500 Gram Denver Lab Flotation Cells
1—1000 Gram Morse Lab Flotation Cells
4—2000 Gram Denver Lab Flotation Cells
2—Stearns-Roger Lab Pressure Filter
1—18" x 27" Revolving Lab Dryer
1—16" Lab Pug Mill

SCREENS

1—18" x 56" Traylor Vibrating Screen
1—34" x 12' Symons Single Deck Screen
1—3' x 8' Simplicity 3 deck Screen
1—4' x 12' Tyler 2 deck Screen

FILTERS

2—4' x 2' Morse Drum Filters
1—3' x 4' Oliver Drum Filter
1—4' x 8' Eimco Drum Filter
1—6' x 8' Morse Drum Filter
1—4'—2 disc Denver Leaf Filter
1—6'—2 disc American Leaf Filter
1—6'—2 disc Oliver Leaf Filter
1—6'—5 disc Morse Leaf Filter
1—18" Morse Filter Press
1—36" Sweetland #12 Filter Press

COMPRESSORS

1—42 CFM Ingersoll-Rand NE-1
2—88 CFM Ingersoll-Rand ER-1
1—120 CFM Ingersoll-Rand ER-1, 8" x 6"
1—161 CFM Chicago-Pneumatic PB-2
1—173 CFM Chicago-Pneumatic Class N5B
1—179 CFM Ingersoll-Rand NE-1
1—230 CFM Ingersoll-Rand Type 10
1—330 CFM Chicago-Pneumatic Type T-CBOA, 250# pressure
1—364 CFM Sullivan WG-9
1—445 CFM Worthington M-80
1—447 CFM Ingersoll-Rand Type 10
1—698 CFM Union Low Pressure
1—900 CFM Ingersoll-Rand Type 10
1—1418 CFM Ingersoll-Rand Type 10-B
3—105 CFM Ingersoll-Rand Portable Gas Engine Driven, Rubber Tire Mounted
1—105 CFM Schramm Portable, Gas Engine Driven, Rubber Tire Mounted
1—105 CFM Ingersoll-Rand, Portable, Gas Engine Driven
1—310 CFM Sullivan Portable, Gas Engine Driven

BALL MILLS

1—4' x 4' Marcy Ball Mill
1—6' x 48" Hardinge Conical Ball Mill
1—8' x 22" Hardinge Conical Pebble Mill

AIR TUGGERS

1—Ingersoll-Rand model D6U
5—Gardner-Denver model HK
1—Sullivan model L-111
2—Joy "Turbinair" model F-113
1—Ingersoll-Rand model HU
1—Gardner-Denver model HM

JAW CRUSHERS

1—8" x 15" Wheeling jaw crusher
1—9" x 24" Cedar Rapids jaw crusher
1—20" x 36" Austin-Western jaw crusher

ELECTRIC SLUSHERS

1—5 HP Brownie tugger model HG
1—5 HP Sullivan tugger model DE
2—7½ HP Sullivan tuggers, model HE
5—5 HP Sullivan 2 drum model HDE
1—10 HP Sullivan 3 drum model HDE-10
1—15 HP Joy 2 drum model AF-212
2—20 HP Ingersoll-Rand 2 drum model 20NM
1—50 HP Sullivan 2 drum model CF-211

ORE CARS

11—15 cu. ft. rotary end dump, 18" ga.
14—18 cu. ft. rotary end dump, 18" ga.
1—20 cu. ft. rotary end dump, 18" ga.
3—21 cu. ft. rotary end dump, 18" ga.
3—26 cu. ft. Card Grandby type cars, 24" ga.
3—27 cu. ft. Koppel rocker dump cars, 24" ga.
6—54 cu. ft. Koppel rocker dump cars, 36" ga.
12—54 cu. ft. Truax rocker dump cars, 36" ga.

LOADERS

2—12-B Eimco loaders
1—21 Eimco loader

DRILLING EQUIPMENT

3—Atlas jackhammers, model RH-656-4W with air legs
4—Ingersoll-Rand jackhammers model X-59
1—Thor sinker, model 38
2—Barco model H-6 paving breakers, gas engine driven
1—Gardner-Denver paving breaker model B-67
1—Gardner-Denver paving breaker model B-87
4—Gardner-Denver self rotating stopers model R-104

WHEN YOU BUY FROM MORSE BROS. YOU ARE DEALING WITH THE LARGEST, OLDEST AND MOST RELIABLE DEALER AND REBUILDER OF USED MINING AND MILLING MACHINERY IN THE COUNTRY. SEND FOR RECONDITIONED MACHINERY BULLETIN 561-M

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. KEystone 4-5261 **Denver 1, Colorado**

BUSINESS MEN'S CLEARING HOUSE

601 MIDLAND SAVINGS BUILDING
DENVER, COLORADO

52 years of world-wide placement service for all classes of executive, engineering, operating, etc., mine and mill men

FILE YOUR APPLICATION WITH US

FEDERAL PIPE & TANK CO.

—WOOD PIPE and WOOD TANKS—

Factory and Main Office
6851 E. Marginal Way
Seattle 8, Wash.

ALLISON STEEL MANUFACTURING COMPANY

Mine and Mill Buildings • Mine Rails • Ore Cars • Steel Gallows Frames • Ball Mills • Muck Plates • Crucible Drill Steel

We offer a complete repair service to the Mining Industry. Our new Machine Shop is equipped to handle your work quickly and economically.

Hot Milling of All Types of Detachable Bits

SOUTH 19TH AVENUE
PHOENIX ARIZONA
PHONE ALpine 8-7731

Compressor: 2200 cfpm Ingersoll PRE-2 with 400 hp syn. motor, etc.
Crusher: 15x38 Alloy Metals roller-brg
Rod Mill: 3x8 Denver Eq., with 30 hp motor, extra rods, etc.
Jig: 16x24 duplex Denver Mineral jig

Paul F. Smith
39 W. Adams St. Phoenix, Arizona

Pneumatic Drills—Witte 8KW Diesel, 3KW Gasoline, 15KW and 30KW Diesel Electric Plants—Mounted Hobart 400 Amp Welders—Ing. Rand Compressors, etc. We have large stocks at very attractive prices.

Appalachian Steel Corp.
Lyndhurst, N. J.

Market Place Advertising

360 inches	$6.50
180 inches	$7.00
90 inches	$7.50
45 inches	$8.00
Less than 45 inches	$8.50

Contract rates based on local number of column inches used within one year.
30 column inches equal one page.
Closing date: 1st of month preceding publication.
(Used and reconditioned equipment, liquidations, property sales only)
For additional 10,000 WORLD MINING export distribution: Add 50%

INDEX OF ADVERTISERS IN MINING WORLD

* *Asterisk indicates firms whose products are catalogued in* MINING WORLD's *1957 Catalog, Survey & Directory Number.*

Acme Personnel Service ... 111
Agence Miniere & Maritime, S.A. ... 105
Allis-Chalmers Mfg. Co., Const. Machy. Div. .. 68-69
*Allis-Chalmers Mfg. Co., Industries Group, Export Div. ... WM2 (World Mining Only)
Allison Steel Mfg. Co. ... 113
*Alloy Steel & Metals Co. .. 102
*American Brake Shoe Co., Export Div. ... WM14 (World Mining Only)
*American Cyanamid Co. .. 41
*American M. A. R. C., Inc. 98
*American Manganese Steel Div. ... 73
*American Smelting & Refining Co. ... 84
*American Zinc Sales Co. .. 88
*Anaconda Co. ... 22
Appalachian Steel Corp. .. 113
Arizona Testing Laboratories 110
Athey Products Corp. ... 10
Atlas Copco AB, Sweden .. 1

*Bethlehem Pacific Coast Steel Corp. ... 34
Black & Deason ... 110
*Boyles Bros. Drilling Co. .. 98
Brown, Inc., David ... 104
*Bunker Hill Co. ... 88
Business Men's Clearing House ... 113

Canadian Metal Mining Association ... 105
*Card Iron Works, C. S. .. 99
Caterpillar Tractor Co. ... 2, 6
Chapman, Wood & Griswold 110
*Chiksan Co. ... 100
*Clark Equipment Co. ... 70-71
*Clark Equipment International, C. A. ... WM28 (World Mining Only)
*Coast Mfg. Co. ... 94
Colorado Assaying Co. ... 110
*Colorado Fuel & Iron Corp. ... 8, 26
*Columbian Steel Tank Co. 94
Cowin & Co., Inc. ... 110

Darien Corp. ... 111
Deggendorfer, T. G. ... 110
*Deister Concentrator Co. .. 103
*Denver Equipment Co. .. 28-39
Diamond Drill Contracting Co. ... 111
Dickinson Laboratories, Inc. 110
*Dorr-Oliver, Inc. ... 42
*Dow Chemical International Ltd. ... WM24 (World Mining Only)

Elliott, E. H. ... 110
*Eimco Corp. ... WM27, 29, 31, Outside Front Cover (World Mining Only)
*Electric Steel Foundry Co. . 29
*Euclid Div., General Motors Corp. ... 19
*Euclid Div., General Motors Overseas Operations .. WM17 (World Mining Only)

Federal Pipe & Tank Co. .. 113

*Gardner-Denver Co. ... 76
Gates Rubber Co. ... 12
*General Motors Corp., Euclid Div. ... 19
*General Motors Overseas Operations, Euclid Div. WM17 (World Mining Only)
*Godoy & Co., Inc., E. A. . 103
Goodall Brothers ... 110
*Goodman Mfg. Co. ... WM20 (World Mining Only)
Goodrich Co., International B. F. ... WM6 (World Mining Only)
*Greensburg Machine Co. .. 103

Hanks, Inc., Abbot A. 110
*Hardinge Co. ... 95
*Harnischfeger Export Corp. WM9 (World Mining Only)
Hawley & Hawley ... 110
*Hewitt-Robins ... 86
*Huber-Warco Co. ... 78
*Hughes Tool Co. ... WM51 (World Mining Only)

Ingersoll, Guy E. ... 110
International Harvester Co. ... 24-25
*International Smelting & Refining Co. ... 88

Jaeger Machine Co. ... 72
*Jeffrey Mfg. Co. ... 14
Johnson, Herbert B. ... 110
*Johns Manville International ... WM64 (World Mining Only)
Jones, Philip L. ... 110
*Joy Mfg. Co. ... 23, 31

Keegel, C. P. ... 110
Kirk Co., Wallace E. 112
*Koehring Overseas Co. 63

Ledeen Mfg. Co. ... 80
Ledoux & Co. ... 110
*LeTourneau-Westinghouse Co. ... 33, 35, 37
Livingston & Wilson Exploration Drilling Co. .. 111
*Longyear Co., E. J. .... 105, Inside Back Cover

MacAfee & Co. ... 110
Machinery Center, Inc. ... 112
Macro Tungsten Refinery .. 114
*Magna Copper Co. ... 88
*Marion Power Shovel Co. .. 87
Marriott, E. J. ... 112
McGriffin, Ken ... 110
Meissner Engineers, Inc., John F. ... 105
*Merrick Scale Mfg. Co. .. 96
*Mine & Smelter Supply Co. 90
Moab Drilling Co. ... 111
Morse Bros. Machinery Co. 113
Murphy, F. M. ... 110

*National Malleable & Steel Castings Co. ... 28
New York-Arizona Development Corp. ... 111
*Nordberg Mfg. Co. ... 15

O'Donnell & Schmidt ... 105
O'Keeffe, John J. ... 110
*Ore & Chemical Corp. ... 81
Ore Research & Laboratories, Inc. ... 110

*Pacific Foundry Co., Ltd. .. 98
Perry Equipment Corp. ... 112
*Philips Export Co. ... WM70 (World Mining Only)
Piggott Projects ... 110

Reed Engineering Co. 94
*Riblet Tramway Co. ... 102

*Santa Fe Tank & Tower Div., Fluor Corp. ... 82
Schroter & Lockwood, Inc. 105
Sherman, Howard P. ... 110
*Simplex Wire & Cable Co. 18
Skookum Co., Inc. ... 94
Smerchanski, Mark G. ... 105
*Smit & Co., Inc., Anton .. 96
Smith-Emery Co. ... 110
Smith, Paul F. ... 113
Southern Spectrographic ... 110
*Standard Oil Co. of Calif. 17
*Standard Steel Corp. ... 84
Still & Still ... 110
*Steody Co. ... 4
*Syntron Co. ... 109

Tate Mine Contracting & Development Co. ... 110
*Thew Shovel Co. ... 30
*Timken Roller Bearing Co. 27
*Traylor Eng. & Mfg. Co. .. 36
Tri-Spective Engineering ... 111
Troyer Equipment Co., Stanley B. ... 111
Turner & Associates ... 110

*Union Oil Co. ... 32
*U. S. Steel Corp. ... 20-21

*Wedge Wire Corp. ... 107
Western Engineering Co. .. 112
*Western Machinery Co. Inside Front Cover
*Western Rock Bit Mfg. Co. 74
*Westinghouse Electric International Co. .... WM32 (World Mining Only)
Westvaco Chlor Alkali Div. 16
*Wickwire Spencer Div., Colorado Fuel & Iron Corp. ... 8
*Wild Heerbrugg Instruments, Inc. ... 85
*Wilfley & Sons, Inc., A. R. Outside Back Cover
Willys Motors, Inc. ... 40
Wilson Exploration Co. 110
Wilson, Glenn B. ... 112
Wisser & Cox ... 110
Wolf, Henry J. ... 110
Wood Assaying Co., Henry E. ... 110
Wood, Kenneth ... 111

QUALIFIED MECHANICAL ELECTRICAL ENGINEER WANTED

Large mining company with important interests in Latin-American countries searching for Mechanical-Electrical Engineer with good mining and construction background for position of Assistant to Chief Engineer. Individual should be 33 to 40 years of age and qualified to take over duties of Chief Engineer after several years of training. Permanent residence in U. S. with occasional trip to foreign operations. Write Box J-2, Mining World, 500 Howard Street, San Francisco 5, California.

MINING ENGINEER: Age 42, desires managerial or supervisory position. 20 years experience in all phases of open pit and underground mining, including exploration and geophysics. Good background in business methods and labor relations. Reply Box J-3, Mining World, 500 Howard Street, San Francisco 5, California.

RICH IRON ORE DEPOSIT: Just discovered, requires financial and eventual technical aid. Write C. M. F. Cunha, Bella VistaDuler, Mapuca, Goa, Portuguese India.

MINING OPPORTUNITY: True gossan, gold, silver, copper ore. Core drilling should show concentration from area containing sixty thousand tons fifteen dollar ore. Want to buy out associates who won't put up money. Offer control to party matching present investment of twenty thousand dollars. No pikers or promoters, please. Worthy investigation. Walter Lehman, Box 780, Lewistown, Montana.

ORE BODIES LOCATED, including uranium, even with no outcrop or surface indication. Service used by major companies. Years of proven success.

YOUNG & CRITCHLOW GEOPHYSICAL SERVICE
1975 N.W. Everett St. Portland 9, Ore.

CORE DRILLING EQUIPMENT:: Exceptional opportunity for a group or individual to purchase machinery, vehicles, equipment, reports and surveys of a drilling firm. All equipment in first class condition. A new way of life offered in a highly rewarding field. Write Box J-1, Mining World, 500 Howard Street, San Francisco 5, California for complete inventory and prices.

FOR SALE: 11 Dorr-Oliver 6-inch Duplex Diaphragm Pumps number 6VM nine to 30 cfm, also six same type 8-inch 12 to 75 cfm number 8W. Good condition, never used. Also have spare parts. Write C. F. Spencer, 901 Latham Square Building, Oakland 12, California.

FOR SALE: 2 ton battery locomotive. Pumps, compressors, crushers, ball mills, power line, air and vent pipe, mine rail, etc. Northern Equipment Co., Box 904, Helena, Montana.

MINING PROPERTY FOR SALE: Placer and lode. Gold. Write for information to Violet A. Johnson, Box 308, Kamiah, Idaho.

CLASSIFIED SECTION

8 pt. type 15c per word. 10 pt. type 20c per word. Minimum charge $5.00.

(For Box numbers addressed to Mining World, add $1.00)

Boxed ads (display) in either Market Place or Classified Sections—$8.50 per column inch.

(See Market Place Section for lower contract rates).

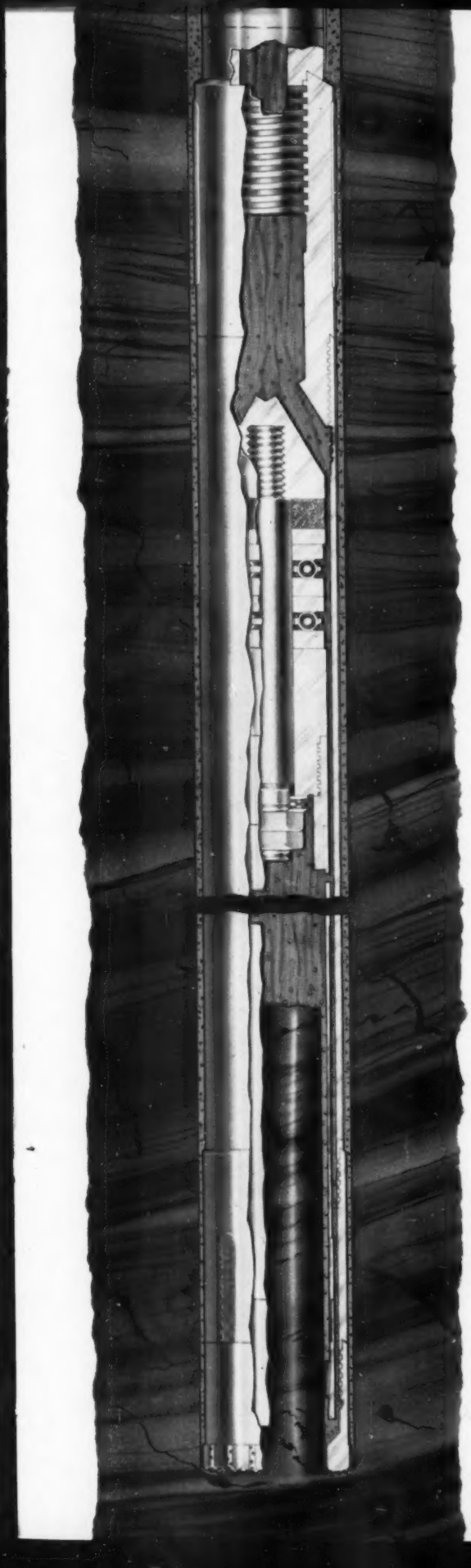
Closing Date: If proof required, 1st of preceding month, otherwise 10th.

SCRAP TUNGSTEN CARBIDE ROCK BIT INSERTS

are regularly purchased by Macro Tungsten Refinery. For our quotation F.O.B. shipping point, write P.O. Drawer 440, Port Coquitlam, B.C., Canada.

DIVIDEND NOTICE

The Board of Directors of the Palo Alto Mining Corporation declared a 10¢ dividend on the $1.00 par value common stock. Dividend payable as of April 30, 1957. Books will remain open. Stephen S. Ridgely, Sr., President; Virgil R. Herring, Secretary & Treasurer, 14900 Coleman Road, San Jose 24, California



3 things make the Longyear "L" Series Barrel better than any other

Drillers using Longyear "L" Series Core Barrels *report better recovery in ground that is hard to core.* In one broken, unconsolidated ore zone, the "L" Series Barrel increased recovery from 40 to 89%, compared to results with another type of barrel. Some 15,800 feet were drilled with the "L" Series Barrels in this formation. Three things make the "L" Series Core Barrels better by drillers' standards:

1. With most other core barrels, slight wear and heavy downward pressure can cause belling at the joints. When this happens, the tools stick tight in the hole. *Bevel shoulders on "L" Series Core Barrels, bits and shells eliminate belling by greatly strengthening joints in the lower end.*

2. "L" Series Core Barrels have a slip fit between the core lifter case and inner tube instead of the usual threaded connection. No special tools are needed to separate them, so there is less chance of distortion. Consequently these vital parts *work the way they should longer.*

3. The Longyear Water Shut-off Valve eliminates errors in detecting a block. In closed circuit drilling (possible with Longyear Transmission Pumps), the driller gets a positive indication when a block occurs, and stops drilling before grinding of core starts. Thus, the Shut-off Valve improves core recovery and holds down bit costs, which soar when grinding takes place.

The Longyear representative in your area can tell you more about the advantage of the "L" series and other fine Longyear Core Barrels.

E. J. Longyear Company, **MINNEAPOLIS 2, MINN.**

CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO • LONGYEAR ET CIE., PARIS, FRANCE
LONGYEAR N. V., THE HAGUE, HOLLAND

Diamond Core Drill Manufacturers • Core Drilling Contractors
Mining Engineering and Geological Consultants

5 reasons why

WILFLEY
SAND PUMPS

provide Lower Pumping Costs per ton of material moved!

Wilfley Sand Pumps
"Companions in Economical Operation"
Wilfley Acid Pumps

Individual Engineering on Every Application

Write, wire or phone for complete details.

A. R. WILFLEY AND SONS, INC.

Denver, Colorado, U.S.A.
New York Office: 122 East 42nd Street, N.Y. City 17, New York

1 Maintained higher efficiency throughout the life of wearing parts.

2 Long-wearing parts of hard alloy or abrasion-resistant rubber.

3 Quick-change features reduce maintenance cost and minimize downtime.

4 Unique packingless design and rugged construction make long maintenance-free operation a reality.

5 Simple, efficient design assures trouble-free, economical operation.